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(54) Disc cartridge

(57) A cartridge main body (34) formed by halves (32, 33) for housing a disc (31) having a magnetic member (30) at its centre is provided with a recess (82) in the underside of the upper half (32), the recess being formed by spaced annular lugs (81, 82) which can engage the disc (31) and the magnetic member (32) respectively so that a projection on the disc formed when the magnetic is secured thereto does not contact the disc half (32) and produce debris. Reinforcing projecting ribs (84a, 84b) and reinforcing projections (88, 89) are provided on the halves (32, 33) of the main body (34) in the vicinity of apertures (39, 40) for insertion of a recording/reproducing head of recording/reproducing apparatus and in the vicinity of an adjacent side edge of the cartridge main body (34) along which a shutter (41) can be slid to cover or not to cover the apertures (39, 40). A shutter locking member (47), provided with a portion (60) of flexible material, can pivot on the housing half (33) and is engaged by an engaging part (48) of the shutter (41).

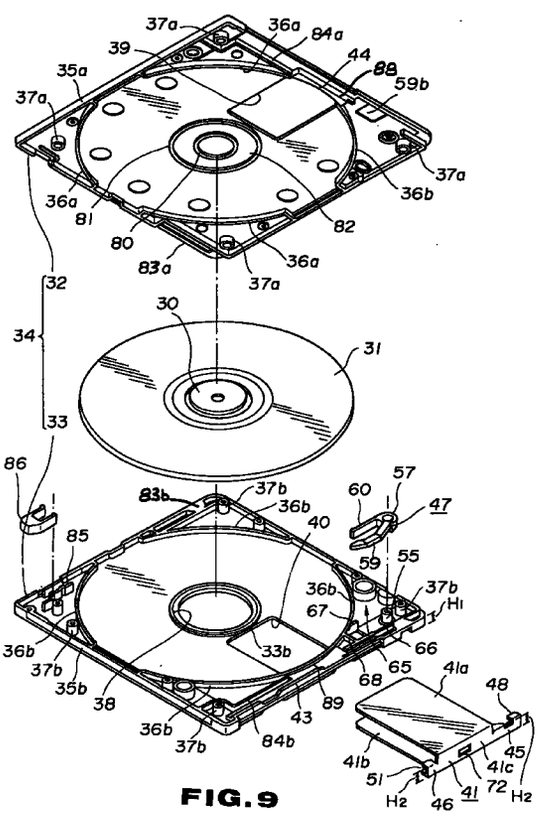

FIG. 9

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Description

This invention relates to a disc cartridge housing therein a disc on which desired information signals are or can be recorded.

There has hitherto been proposed a disc for recording desired information signals, such as an optical disc or a magneto-optical disc.

A disc of this kind of an extremely small size capable of recording information signals with high density has been proposed. For example, in the case of a magneto-optical disc, a disc having a diameter of not more than 64 mm, has been proposed.

The magneto-optical disc which is small-sized and capable of high density recording is loaded on the disc rotating and driving unit and rotated at a higher velocity. As the disc is rotated at the higher velocity, a light beam from an optical pickup is irradiated on a fine recording track(s) formed on a major disc surface, while an external magnetic field is applied by a magnetic head, thereby to record desired information signals on the disc.

For accurately irradiating the light beam on the fine recording track during the high velocity disc rotation, it is necessary for the magneto-optical disc to be positively secured to a disc table of the disc rotating and driving device and to be loaded thereon with the centre of rotation of the disc correctly aligned with the axis of the disc table.

For positively loading and securing the small-sized magneto-optical disc on the disc table with high accuracy, there is proposed a disc loading system in which a metallic plate formed of a magnetic material is arranged on the magneto-optical disc and attracted by a magnet provided on the disc table for clamping the disc to the disc table.

A magneto-optical disc 1 shown in Figures 1 and 2 of the accompanying drawings has been proposed as a magneto-optical disc employed in such a disc clamping system which makes use of the magnetic force of attraction. The magneto-optical disc 1, shown in Figures 1 and 2, is provided with a disc substrate 2 formed as a transparent polycarbonate resin. A signal recording layer for recording desired information signals is deposited on one major surface 2a of the disc substrate 2. The opposite major surface 2b of the disc is a write/read surface. It is from the side of this write/read surface that the light beam is radiated from an optical head to the signal recording layer for recording or reproducing information signals.

A centreing hole 3, engaged by a centreing member arranged on the disc table of the disc rotating and driving unit, is formed at the centre of the disc substrate 2. A recess 5 to house a metallic plate 4, which is a magnetic member to be attracted by a magnet provided on the disc table, is formed at the centre of said one major surface 2a of the disc substrate 2. The recess 5 has a depth significantly larger than the thickness of the metallic plate 4. The metallic plate 4, housed within the recess 5, is formed with an angled intermediate part 4a and a peripheral flange 4b which is contiguous to the intermediate part 4a and rests on a resting surface 5a on the bottom of the recess 5. That is, the metallic plate 4 is formed as a cap having a height corresponding to the vertical height of the intermediate part 4a.

The above-described metallic plate 4 is housed within the recess 5 with the peripheral flange 4b resting on the resting surface 5a so that a gap is defined between the outer surface of the intermediate part 4a and the inner surface of the recess 5. The metallic plate 4 is retained in the recess 5 by having the peripheral flange 4b retained by a plurality of, e.g. four retaining projections 5b formed by locally thermally deforming the rim of the recess 5.

An annular step 6 is formed at the centre of the major surface 2b of the disc substrate 2 to surround the centreing hole 3, as shown in Figure 2. The function of the annular step 6 is to increase the depth relative to the centreing hole 3 of a centreing member provided on the disc table on which the magneto-optical disc is loaded to ensure positive centreing of the disc 1 with respect to the disc table.

The metallic plate provided on the magneto-optical disc employed in the disc loading system which makes use of the magnetic force of attraction is attached to the major surface of the magneto-optical disc, such as with an adhesive, to close the centreing hole bored at the centre of the magneto-optical disc. When the magneto-optical disc, having the metallic plate attached thereto, is set on the disc table, it is clamped to the disc table, under the force of attraction by the magnet provided thereon for rotation in unison with the disc table. The magneto-optical disc, capable of high-density recording of information signals, is housed in a cartridge main body, as a disc cartridge, to prevent deterioration of recording/reproducing properties due to deposition of dust and dirt or damage, and is loaded on the recording/reproducing apparatus or laid in store in this state.

Figures 3, 4 and 5 shows an arrangement of a disc cartridge of previously proposed kind.

The disc cartridge includes a rectangular cartridge main body 9 formed by abutting and connecting an upper half 7 and a lower half 8 to each other to house the magneto-optical disc 1 therein. A disc housing section is provided in the cartridge main body 9 rotatably to house the magneto-optical disc 1.

The cartridge main body 9 is formed with an inlet opening 10 into which a disc table of the disc rotating and driving unit rotationally to drive the cartridge main body 9 is introduced when the disc cartridge is loaded onto recording/reproducing apparatus. Referring to Figure 5, the inlet opening 10 is a circular opening formed at the mid part of the lower half 7 for exposing the inner peripheral region inclusive of the centreing hole 3 of the magneto-optical disc 1 housed within the cartridge main body 9 set on the disc table.

The upper and lower surfaces of the cartridge main body 9, that is the upper and lower halves 7 and 8, are

formed with recording/reproducing apertures 11, 12 to expose at least a part of the signal recording region of the magneto-optical disc 1 accommodated in the cartridge main body 9 to outside between the inner and the outer peripheries of the disc. Referring to Figure 3, the recording/reproducing apertures 11 and 12 are each formed as rectangular apertures at a transversely mid part of the cartridge main body 9 extending from a position close to the inlet opening 10 towards a front side of the cartridge main body 9.

A shutter member 13 is provided on the cartridge main body 9 to close the recording/reproducing apertures 11, 12 to prevent dust and dirt from intruding by means of the recording/reproducing apertures 11, 12 into the inside of the cartridge main body 9 and being deposited on the magneto-optical disc 1. The shutter member 13 is formed by punching and bending a thin metallic plate into a rectangular frame having a U-shaped cross-section and is composed of shutter sections 13a, 13b closing the recording/reproducing apertures 11 and 12 and a connecting web 13c interconnecting the distal parts of the shutter sections 13a, 13b. A slide guide 13d is formed at one side of the connecting web 13c to guide the shutter member 13 parallel to the front side of the cartridge main body 9.

The shutter member 13 is fitted on the front side of the cartridge main body 9 so that the shutter sections 13a, 13b extend over the recording/reproducing apertures 11, 12. The shutter member 13 is mounted on the cartridge main body 9 to slide between a position of closing the recording/reproducing apertures 11, 12 as shown by solid lines in Figures 4 and 5 and a position of opening the recording/reproducing apertures as shown by broken lines in Figure 4.

Referring to Figures 3 and 4, a shutter locking member 14 is provided at a corner on the front side of the lower half 7 of the cartridge main body 9 to be engaged with an engaging part 13e formed by partially bending the slide guide 13d to maintain the shutter member 13 at a closure position thereby to prevent inadvertent movement of the shutter member 13 away from the position of closing the recording/reproducing apertures 11, 12 to open the apertures 11 and 12.

The shutter locking member 14 is formed by moulding synthetic resin and, as shown in Figure 3, includes an attachment part 14a at a proximal side thereof for attachment to the lower half 7 and a locking arm 14b extending along a curved path from one end of the attachment part 14a. The distal end of the locking arm 14b is formed with an engaging notch 14c engaged by the engaging part 13e of the shutter member 13. The connection portion of the locking arm 14b to the proximal attachment part 14a is a resilient flexible section 14d of reduced thickness.

The shutter locking member 14 is mounted on the lower half 7 with a pair of attachment pins 7a of the lower half 7 engaged in through-holes 14e, 14e formed in the attachment part 14a and with the engaging notch 14c facing the front side of the cartridge main body 9, as shown in Figure 3.

When the shutter member 13 mounted on the cartridge main body 4 is slid to a position closing the recording/reproducing apertures 11, 12, as shown in Figure 4, the mating engaging part 13e is engaged in the engaging notch 14c of the shutter locking member 14, which is thereby locked in the position of closing the recording/reproducing apertures 11, 12.

When the above-described disc cartridge, which is provided with the shutter locking member 14 which can lock the shutter locking member 13 at the position of closing the recording/reproducing apertures 11 and 12, is introduced into a cartridge loading unit of recording/reproducing apparatus, in the direction shown by arrow A in Figure 4 as an inserting direction, a shutter actuating pin 16 provided in the recording/reproducing apparatus intrudes into an inlet groove 15 formed on the front side of the cartridge main body 9. As the disc cartridge is introduced into the disc loading unit, the shutter actuating pin 16 rides on the locking arm 14b of the shutter locking member 14, from the outer lateral side of the proximal end towards the distal end thereof, resiliently to flex the flexible section 14d and to thrust the locking arm 14b inwardly into the cartridge main body 9, as shown by arrow B in Figure 6. As a result of the movement of the locking arm 14b into the cartridge main body 9, the mating engaging part 13e ceases to be engaged in the engaging notch 14c, so that the shutter member 13 can be moved by the shutter actuating pin 16 in the direction of opening the recording/reproducing apertures 11 and 12.

The cartridge main body 9 of the disc cartridge formed by an upper half 7 and a lower half 8 abutted and connected to each other is provided with annular supporting ribs 7b, 8a, Figures 7 and 8, on the inner sides of the upper half 8 and the lower half 7 to support a non-recording region N of the magneto-optical disc 1 about the rim of the centre hole 3 of the magneto-optical disc 1. By providing these annular supporting ribs 7b, 8a on the cartridge main body 9, the magneto-optical disc 1 is housed within the cartridge main body 9 so that a signal recording region extending from the rim of the centre hole 3 to the vicinity of the outer rim of the disc 1 is out of contact with the inner surface of the cartridge main body 1. In this manner, the magneto-optical disc 1 may be rotatably accommodated in the cartridge main body 9 so that the signal recording region S is not damaged by e,g, abrasion.

If the retaining projections 5b for the metallic plate 5 are formed by thermally deforming several rim portions of the recess 5 as shown in Figures 1 and 2, there is a risk that a pointed protuberance 2c can be formed on said one major surface 2a of the disc substrate 2, as shown in Figure 2.

If the disc having such a pointed protuberance 2c on said one major surface of the disc substrate is accommodated in the cartridge main body, there is a risk that the protuberance can contact the inner surface

of the cartridge main body to produce debris removed from the protuberance, such debris being then deposited on the write/read surface of the magneto-optical disc to render it impossible to write and/or read information signals.

Above all, the disc cartridge housing a small-sized magneto-optical disc is of small plan size and thickness, so that the disc housing section in the cartridge main body is also of a thickness only slightly greater than the thickness of the magneto-optical disc. If the above-described protuberance is formed on the disc substrate, it is not possible to prevent the protuberance and the inner surface of the cartridge main body from making contact with each other, so that debris is inevitably produced.

On the other hand, since the supporting rib 8a formed on the upper half 8 supporting the magneto-optical disc 1 is formed as a ring and hence supports only the non-recording region N of the magneto-optical disc 1, a space A is generated between the metallic plate 4 disposed on the radially inner side of the supporting rib 8a and the inner surface of the supporting rib 8a when the magneto-optical disc 1 is thrust upwards towards the upper half 8, as shown in Figure 8. The result is that, if the metallic plate 4 is thrust by means of the centreing hole 3 communicating with the inlet opening 10 and is subjected to a pressure lifting it in the direction shown by arrow Y in Figure 8, only the magneto-optical disc 1 is abutted and acted upon by the supporting rib 8a so that the metallic plate 4 may be detached from the disc 1.

If the metallic plate 4 becomes detached in this manner, the magneto-optical disc 1 cannot be attracted and clamped by the magnet provided on the disc table, so that the magneto-optical disc 1 cannot be rotated and hence information signals cannot be recorded or reproduced.

The disc cartridge shown herein is of a rectangular shape of as small a size as possible, in association with the size of the disc to be housed therein, for ease of handling and for reducing the size of the recording and/or reproducing apparatus.

With the above-described disc cartridge, if the recording/reproducing aperture which exposes the signal recording region of the disc accommodated therein to outside across the inner and outer peripheries of the disc is formed in the cartridge main body, the portion of the disc cartridge provided with the recording/reproducing apertures is reduced in strength.

With the small-sized disc cartridge accommodating the small-sized disc therein, it may be impossible to ensure sufficient strength of the cartridge main body, such that the cartridge main body tends to be flexed and deformed under a smaller external force.

Since a groove engaged by a retainer for the shutter member attached to the cartridge main body is formed on the lateral side of the cartridge main body provided with the recording/reproducing apertures to extend along the direction of movement of the shutter member, the portion of the cartridge main body provided with the cartridge main body is reduced significantly in strength, so that sufficient strength cannot be ensured. Besides, the shutter member attached to the disc cartridge tends to be detached.

With a disc cartridge in which a groove for permitting entrance of a shutter actuating member to open the shutter member is formed in the front side of the cartridge main body along which the shutter member is slid, the front side of the cartridge main body which is provided with the groove undergoes significant flexure and deformation because the peripheral wall is removed to form the groove.

Since the shutter locking member of the conventional disc cartridge is formed as a resin moulded member, it is extremely difficult to mould the shutter locking member with high accuracy because of thermal shrinkage produced at the time of moulding.

In the conventional shutter locking member 13 in which the locking arm 14b is extended by means of the resilient flexible section 14d from one end of the attachment section 14a, it is not possible to ensure constant height h from the attachment section 14a as a mounting reference to the cartridge main body 9 to the top of the locking arm section 14b in which the engaging notch 14c is formed. The result is that, when the shutter locking member 13 is attached to the cartridge main body 9 with the attachment section 14a as the mounting reference, it is not possible to ensure a constant position of the locking arm 14b facing the groove 15 for the shutter actuating member formed in the front side of the cartridge main body 9, so that the shutter locking member 13 is subjected to variable deflection under a thrust exerted by the shutter actuating pin 16. Thus stable unlocking operation of the shutter member 13 cannot be ensured. There is a risk that the mating engaging part 13e cannot be engaged positively in the engaging notch 14c so that the shutter member 13 cannot be positively locked at the position of closing the recording/reproducing apertures 11 and 12, while there is also a risk that the apertures may be inadvertently opened to damage the magneto-optical disc 1 housed within the cartridge main body 9.

According to the invention there is provided a method for moulding a disc cartridge half by injection moulding of synthetic resin, said cartridge half being rectangular and having a first aperture at the centre for insertion of disc rotating and driving means and a second recording/reproducing aperture at the middle of a lateral side between the first aperture and said lateral side, the cartridge half having a recessed shutter slide area on an outer major surface thereof in which a shutter member to close said second aperture is slid, wherein a gate for injection moulding of synthetic resin is provided at a position close to the first aperture and offset towards the side of the cartridge half provided with the shutter slide area with respect to the centre in the sliding direction of the shutter member.

The invention is diagrammatically illustrated by way of example in the accompanying drawings, in which:

Figure 1 is a perspective assembly view showing a magneto-optical disc accommodated within a disc cartridge of previously proposed kind;
Figure 2 is a cross-sectional view of the magneto-optical disc of Figure 1 in which a metal plate is attached to a disc substrate;
Figure 3 is an exploded perspective view showing a disc cartridge of previously proposed kind;
Figure 4 is a perspective view showing the disc cartridge of Figure 3 from the upper side;
Figure 5 is a perspective view showing the disc cartridge of Figure 3 from the lower side;
Figure 6 is a partial plan view of a cartridge main body showing a shutter mechanism of the disc cartridge of Figure 3;
Figure 7 is a cross-sectional view showing the disc cartridge of Figure 3;
Figure 8 is a cross-sectional view showing a magneto-optical disc raised towards the upper half within the disc cartridge of Figure 3;
Figure 9 is an exploded perspective view of a disc cartridge according to a first embodiment of the invention;
Figure 10 is a perspective view showing the disc cartridge of Figure 9 from the upper side;
Figure 11 is a perspective view showing the disc cartridge of Figure 9 from the lower side;
Figure 12 is a plan view showing a lower half showing an arrangement of a gate for moulding the lower half of a disc cartridge according to the invention;
Figure 13 is a cross-sectional view taken along line II-II of Figure 12 showing a lower half of the disc cartridge shown in Figure 12;
Figure 14 is a perspective view of a shutter locking member of a shutter locking unit of a disc cartridge according to the first embodiment of the invention, as viewed from a lateral side;
Figure 15 is a perspective view of a shutter locking member of a shutter locking unit of a disc cartridge according to the first embodiment of the invention, as viewed from the other lateral side;
Figure 16 is a partial plan view showing the state in which the shutter locking member shown in Figures 14 and 15 is arranged on the cartridge main body;
Figure 17 is a partial plan view of the cartridge main body showing the state in which the shutter locking member shown in Figures 14 and 15 is rotated to unlock the shutter member;
Figure 18 is a perspective view, from the upper surface side, showing the state in which the shutter member is moved to a position of opening the aperture in the cartridge main body;
Figure 19 is a perspective view, from the lower surface side, showing the state in which the shutter member is moved to a position of opening the aperture in the cartridge main body;
Figure 20 is a partial plan view of the cartridge main body showing the shutter locking member in a state in which the shutter member is moved to a position of opening the aperture in the cartridge main body;
Figure 21 is a partial cross-sectional view showing the front end face of the disc cartridge according to the first embodiment of the invention;
Figure 22 is a plan view, from the upper surface side, showing a disc cartridge according to the first embodiment of the invention;
Figure 23 is a plan view, from the lower surface side, showing a disc cartridge according to the first embodiment of the present invention;
Figure 24 is a partial cross-sectional view of the front end face side showing a disc cartridge according to the first embodiment of the invention;
Figure 25 is a cross-sectional view showing a disc cartridge according to the first embodiment of the invention;
Figure 26 is a cross-sectional view showing the state in which the magneto-optical disc of the first embodiment of the invention is raised towards the upper half;
Figure 27 is a cross-sectional view showing a disc cartridge according to a second embodiment of the invention;
Figure 28 is a cross-sectional view showing the state in which a magneto-optical disc of the second embodiment of the invention is raised towards the upper half;
Figures 29 to 33 are perspective views showing modifications of the plate support of a disc cartridge of the second embodiment of the invention;
Figure 34 is a plan view of a disc cartridge of a third embodiment of the invention;
Figure 35 is a cross-sectional view of the disc cartridge, taken along line X-X in Figure 34;
Figure 36 is a plan view showing the state in which a coil for generating an external magnetic field reaches the outermost part of the magneto-optical disc accommodated in a disc cartridge according to the third embodiment of the invention; and
Figure 37 is a cross-sectional view showing a modification of a reinforcement of a disc cartridge according to the third embodiment of the present invention.

Referring to the drawings and firstly to Figure 9, a disc cartridge similar to the above-described disc cartridge of previously proposed kind, includes a rectangular cartridge main body 34 made up of an upper half 32 and a lower cartridge half 33 abutted and connected to each other. Within the cartridge main body 34, a disc-shaped recording medium, such as a magneto-optical disc 31 capable of re-recording information signals, is rotatably accommodated.

Upstanding peripheral wall sections 35a, 35b, abutted to each other and constituting an outer peripheral wall 35 of the cartridge main body 34, are formed on the

outer perimeter of the upper half 32 and the lower half 33 of the cartridge main body 34, respectively. Upstanding wall sections 36a, 36b are formed on the confronting inner surfaces of the upper half 32 and the lower half 33 to abut each other to constitute a disc housing section. The wall sections 36a, 36b are each formed to define an arc of a circle inscribing the upstanding peripheral wall sections 35a, 35b. The corner sections of the confronting inner surfaces of the upper half 2 and the lower half 3 are formed with projections 37a, 37b, respectively, fitting one into the other.

An annular plate support 80 and an annular supporting lug 81 concentric with the support 80 are formed at the centre of the inner surface section delimited by the wall section 36a so that the support 80 and the lug 81 project from the inner surface of the upper half 32 to abut a metal plate 30 of the magneto-optical disc 31 as later explained. A recess 82 delimited by the plate support 80 and the supporting lug 81 provide a clearance to avoid a protuberance which is generated when mounting the metal plate 30 on the magneto-optical disc 31 as later described. A half rib 84a is formed on an outer side of the wall section 36a of the upper half 32 to extend along the lateral side of the upper half 32 on which a shutter member 41 as later explained is mounted. A step 83a is formed at a diametrally opposite position of the upper half 32 with respect to the half rib 84a.

A mating half rib 84b and a mating step 83b are formed on the inner surface of the lower half 33 to face the half rib 84a and the step 83a of the upper half 32, respectively. When the upper and lower halves 32 and 33 are connected to each other, the steps 83a, 83b define a groove to prevent mistaken insertion of the disc cartridge into the inside of the recording/reproducing apparatus.

A guide member 85 is mounted to project from the inner surface of the lower half at a corner of the lower half 33 diametrally opposite to the corner of the lower half 33 provided with a shutter locking member 47. The guide member 85 is embraced by a write-protect operating knob 86 having a pair of arm sections. The operating knob 86 may be displaced by means of operating apertures, not shown, formed by segmenting a part of the upstanding peripheral wall sections 35a, 35b of the upper and lower halves 32, 33 to open or close a detection opening 33a formed in the lower half 33. By opening or closing the detection opening 33a with the operating knob 86 in this manner, it can indicate whether or not information signals may be recorded on the magneto-optical disc 31.

By abutting the upstanding peripheral wall sections 36a, 36b, wall sections 36a, 36b and half rib 84a, 84b and by fitting and welding the projections 37a, 37b to each other, the upper and lower cartridge halves 32, 33 may be connected to each other to form the cartridge main body 34 rotatably housing the optical disc 31.

The cartridge main body 34, thus formed by abutting and connecting the upper half 32 and the lower half 33 to each other, is formed with an aperture 38 into which a disc table of a disc rotating and driving device can intrude rotationally to drive the magneto-optical disc 31 housed within the cartridge main body 31 when the disc cartridge is loaded into recording/reproducing apparatus. The aperture 38 is a circular aperture formed at a mid part of the lower half 32, as shown in Figure 9, to expose a rim of a centre aperture 31a of the magneto-optical disc 31 housed within the cartridge main body 34 which is closed by a metal plate 30 to effect magnetic clamping.

The upper and lower surfaces of the cartridge main body 34, that is the upper and lower halves 32, 33, are formed with recording/reproducing apertures 39, 40, to expose at least a part of the signal recording region of the magneto-optical disc 31 to outside, respectively. As shown in Figures 9, 10 and 11, these apertures 39 and 40 are rectangular apertures disposed at a transversely mid part of the front side of the cartridge main body 34 and extend from the vicinity of the aperture 38 as far as the front side of the cartridge main body.

The shutter member 41 is movably mounted on the front side to open and close the recording/reproducing apertures 39, 40 so that the apertures 39, 40 may be closed by the shutter member 41 to prevent foreign matter from intruding into the inside via these apertures 39, 40.

The front side of the cartridge main body 34, along which the shutter member 41 is moved, is formed with a groove 42 into which intrudes a shutter opening pin which is provided on the recording/reproducing apparatus to displace the shutter member 41. As shown in Figures 10 and 11, the groove 42 has a terminal end 42a at a lateral side of the cartridge main body 34 which is orthogonal to the front side thereof and is formed to extend along the direction of movement of the shutter member 41.

A shutter slide guide wall 43 is formed within the groove 42 to ensure stable movement of the shutter member 41. As shown in Figure 9, the wall 43 is formed upright on the front side of the lower half 33.

An abutment wall 44 is formed on the front side edge of the recording/reproducing aperture 39 formed in the upper half 32 so that the wall 44 can abut the inner surface of the front side of the lower half 33 to prevent flexure of the cartridge main body 34 along the thickness thereof at the site of the groove 42, as later described.

The shutter member 41 to open or close the recording/reproducing apertures 39, 40 is formed by bending a thin metal sheet into the cross-sectional shape of a letter U which is made up of shutter parts 41a, 41b closing the apertures 39, 40, respectively and a connecting web 41c interconnecting the proximal ends of the shutter parts 41a, 41b.

First and second slide guides 45, 46 are formed on both sides of the connecting web 41c stably to guide the shutter member 41 along the front side of the cartridge main body 34. The first and second slide guides 45, 46 are bent in the form of a letter U having a height H_2 sub-

stantially corresponding to a height H_1 of the front side of the lower half 33.

The distal end of the first slide guide 45 is formed with an engaging part 48 which is inserted into the groove 42 formed in the front side of the cartridge main body 34 when the shutter member 41 is mounted on the cartridge main body 34. The engaging part 48 is engaged with the shutter locking member 47 provided within the cartridge main body 34.

The distal ends of the first and second slide guides 45, 46 extending to the lower half 33 are formed with extrication prevention guide lugs 50, 51 to engage in a guide groove 49 formed on an outer lateral surface of the lower half 33 to guide the movement of the shutter member 41 and inhibit extrication of the shutter member 41 from the cartridge main body 34.

Referring to Figures 10 and 11, the shutter member 41 is fitted to the front side of the cartridge main body 34, so that the shutter parts 41a, 41b extend over the recording/reproducing apertures 39, 40.

The first and second slide guides 45, 46 are engaged with the front side of the lower half 33, with the guide lugs 50, 51 being engaged with the guide groove 49 and with the portion of the first slide guide 45 introduced into the groove 42 extending over the upper end face of the slide guide wall 43. The engaging part 48, formed integral with the first slide guide 45, protrudes into the groove 42.

The shutter member 41, thus fitted to the cartridge main body 34, with the first and second slide guides 45, 46 clamping the front side of the lower half 33, is mounted on the cartridge main body 34 to slide between the position of closing the recording/reproducing apertures 39, 40 and the position of opening the recording/reproducing apertures, in such a manner that the shutter member 41 is guided during its sliding movement by the guide groove 49 engaged by the guide lugs 50, 51 and the first and second slide guides 45, 46 prevent it from wobbling during its sliding movement over the slide guide wall section 43.

Slide guide recesses 52, 53 and 54, each having a depth equal to the thickness of the plate material of the shutter member 41, are formed in a sliding region of the shutter member 41 inclusive of lateral side edges of the recording/reproducing apertures 39, 40 and the front side of the cartridge main body 34. By forming the slide recesses 52 to 54 in this manner, the shutter member 41 may be mounted flush with the surface of the cartridge main body 34 to prevent the cartridge main body 34 from being increased in thickness.

Meanwhile, since the lower half 33 has a variable thickness between the region thereof provided with the slide recess 53 and the remaining region, and since the recording/reproducing aperture 40 and the aperture 38 for the disc table are also provided, it becomes difficult to introduce the synthetic resin uniformly into a mould in the case of injection moulding in accordance with a one-point gate system.

For injection moulding the lower half 33 with a synthetic resin, a gate 87 for injection moulding of synthetic resin is provided at a position which is offset towards the shutter slide recess 53 with respect to a centreline O of the lower half 33 interconnecting the centre of the aperture 38 for the disc table and the centre of the recording/reproducing aperture 40 as shown in Figure 12 and which is proximate to the aperture 38 for the disc table. Thus, the gate 87 is provided at a mid part of the lower half 33 proximate to the aperture 38 for the disc table and offset towards the slide recess 53 of reduced thickness. In the present embodiment, the gate 87 is provided at a position offset about an angle θ of 15° towards the slide recess 53 with respect to the centreline O.

If molten synthetic resin is injected at the gate 87, arranged in this manner, into the inside of a metal mould to mould the lower half 33, the resin will flow into the mould as two fractional streams R, S flowing on both sides of the aperture 38.

Since the gate 87 is arranged at a position offset towards the slide recess 53 with respect to the centreline O passing through the front side of the lower half 33, the fractional streams R and S meet at a position of a connecting zone 33b between the aperture 38 and the recording/reproducing aperture 40, which position is offset from the centreline O, that is substantially coincident with a straight line X interconnecting the gate 87 and the centre of the aperture 87, or which is remote from the slide guide recess 53. A weld line W_2 is formed at a confluent position of the two fractional streams R, S.

Similarly, at a connecting zone 33c along the other side edge of the recording/reproducing aperture 40, the two fractional streams meet at a position offset from the centreline O, that is, at a position substantially coincident with the straight line X interconnecting the gate 87 and the centre of the aperture 87, on the side of the lower half 33 remote from the slide guide recess 53. A further weld line W_2 is formed at a confluent position of the two fractional streams R, S.

By offsetting the position of the gate 87 in this manner, the first weld line W_2 may be generated at a wider width portion of the connecting zone 33b offset from the centreline O of the lower half 33 which is the narrowest width portion of the connecting zone 33b.

In other words, the position of generation of the first weld line W_2 may be shifted away from the weakest point of the connecting zone 33b.

On the other hand, the gate 87 is offset towards the reduced thickness side of the lower half 33 where the slide recess 53 is formed as shown in Figure 13 and hence a larger resistance is met. Thus the synthetic resin injected from the gate 87 and flowing on both sides of the aperture 38 may be injected uniformly without producing a moulding time difference between the zone of the slide recess 53 with reduced thickness and the remaining zone of increased thickness, so that the lower half 33 may be formed without producing moulding distortions.

It is noted that, so as not to detract from the appearance of the disc cartridge, the first weld line W_2 is preferably formed within the extent of the connecting zone 33b which is covered by the shutter part 41b when the shutter member 41 is at a position of closing the recording/reproducing aperture 40.

Thus the mounting position of the gate 87 is selected to be offset towards the slide recess 53 with respect to the centreline O of the lower half 33 so that the first weld line W_2 is produced at a position of the lower half 33 which is covered by the shutter part 41b of the shutter member 41.

Although the gate 87 is shown in the above embodiment at a position offset about 15° towards the centreline O, this mounting position of the gate is merely illustrative and may be arbitrarily selected so that the first weld line W_2 is formed at a position of the connecting zone 33b offset towards the slide recess 53 so as to be covered by the shutter part 41b.

Within the cartridge main body 34, there is mounted the shutter locking member 47 to hold the shutter member 41 mounted on the cartridge main body 34 at a position of closing the recording/reproducing apertures 39 and 40.

Referring to Figures 14 and 15, the shutter locking member 47 is formed by moulding synthetic resin, and includes a pivot 57 having a through-hole 56 for passage of an upright supporting shaft 55 mounted on the inner surface of the lower half 33, and a locking arm 59 extending from the pivot 57 and formed with a recess 58 engaged by the engaging part 48 of the shutter member 41. The shutter locking member 47 also includes a resilient flexible tab 60 facing the locking arm 59 and being resiliently deformable when thrust from outside.

The locking arm 59 of the shutter locking member 47 is substantially chevron-shaped and is formed at a bent part of the chevron shape with the engaging recess 58 engaged by the engaging part 48 of the shutter member 41. The engaging recess 58 is defined by a closure wall 59a and is open at the top and on the opposite lateral side, as shown in Figure 15, in consideration that, if the engaging recess 58 should be formed as a notch extending through the entire thickness of the locking arm 59, the locking arm 59 would be reduced in mechanical strength.

The distal end of the locking arm 59 is formed with an inclined guide surface 61 to guide the riding of the engaging part 48 of the shutter member 41 on the locking arm 59 as the engaging part 48 is about to be engaged with the engaging recess 58.

The proximal side of the locking arm 59 is formed with a step 62 by removing the material of the locking arm 59 from its distal end. The step 62 plays the role of being engaged with a mating wall formed on the inner surface of the lower half 33 to limit the rotational movement of the shutter locking member 47.

The distal end of the resilient tab 60 is formed with an abutment bead 63.

Referring to Figure 16, the shutter locking member 47 is arranged in the cartridge main body 34 by having the upright supporting shaft 55 mounted on the inner surface of the lower half 33 passed through the through-hole 56. The upstanding supporting shaft 55 which supports the shutter locking member 47 is formed integral with the lower half 33, and is provided at a mounting zone 65 towards the corner of the front side of the cartridge main body 34 in which the groove 42 has the terminal end 42a.

A rotation limiting wall 66 engaged by the rotation limiting step 62 of the locking arm 59 of the shutter locking member 47 is formed extending parallel to the slide guide wall 43 at the front side corner of the lower half 33 provided with the supporting shaft 55. A supporting lug 67 to support the abutment bead 63 at the distal end of the flexible tab 60 of the shutter locking member 47 is provided extending from the outer lateral side of the wall 36b of the disc housing section parallel to the wall 66 at the corner of the lower half 33 provided with the supporting shaft 55. A supporting projection 68 supporting the distal end of the locking arm 59 of the shutter locking member 47 is formed upright on the inner surface of the lower half 33.

Referring to Figure 16, the shutter locking member 47 is placed at the mounting zone 65 within the lower half 33 by having the supporting shaft 55 passed through the through-hole 56 in the pivot 57, by engaging the step 62 of the locking arm 59 with the rotation limiting wall 66 and by having the abutment bead 63 at the distal end of the flexible tab 60 abutted and supported by the supporting lug 67. At this time, the distal end of the locking arm 59 is supported on the supporting projection 68.

With the shutter locking member 47 thus arranged in the mounting zone 65, the shutter locking member may be mounted in position within the cartridge main body 34 by having the locking arm 59 extend along the groove 42 formed on the front side of the cartridge main body 34, as shown in Figure 16. The engaging member 48 of the shutter member 41, which can slide along the front side of the cartridge main body 34, is ready to be engaged in the engaging recess 58 of the locking arm 59 which faces the groove 42.

Meanwhile, the inner lateral surface of the upper half 32 is formed with a recess 59b to clear a closure wall 59a of the locking arm 59 which, to close the recess 58, is slightly expanded from the normal lateral side of the locking arm 59.

With the shutter locking member 47 thus arranged within the cartridge main body 34, when the shutter member 41 is moved to a position of closing the recording/reproducing apertures 39, 40, as shown in Figures 10 and 11, it is locked at this closure position, with the engaging member 48 engaged in the engaging recess 58, as shown in Figure 17.

If the disc cartridge provided with the shutter locking member 47 is introduced into a cartridge loading unit provided in recording/reproducing apparatus and

provided with a cartridge holder, with the direction indicated by an arrow X shown in Figure 10 as an inserting direction, by following an indicating mark 70 provided on the upper surface of the cartridge main body 34, a shutter opening pin 71 provided in the recording/reproducing apparatus is introduced into the groove 42 formed on the front side of the cartridge main body 34. As the disc cartridge is introduced into the disc loading device, the shutter opening pin 71 rides from the proximal side towards the distal side of the locking arm 59 of the shutter locking member 47 to thrust the locking arm 59 towards the inner side of the cartridge holder 34 as indicated by arrow Y_1 in Figure 17. When the locking arm 59 is thrust, it is rotated in the direction shown by the arrow Y_1 in Figure 17, with the pivot 57 supported by the supporting shaft 55 as a centre of rotation, resiliently to flex the tab 60 which has the abutment bead 63 abutted by the supporting lug 67. The shutter member 41 may now be moved freely because the engaging member 48 is now disengaged from the engaging recess 58.

If, after the shutter member 41 is set free, the disc cartridge is introduced further into the inside of the cartridge loading section, the shutter member 41 is thrust by the shutter opening pin 71 and thereby slid towards the opening position as indicated by arrow O in Figures 10 and 11 to open the recording/reproducing apertures 39, 40 of the cartridge main body 34, as shown in Figures 18 and 19.

When the shutter member 41 is slid as far as the position of opening the apertures, the shutter opening pin 71 ceases to thrust the locking arm 59, so that the flexible tab 60, so far deflected resiliently, is reset rotationally to restore the locking arm 59 in the direction shown by arrow Y_2 in Figure 20, with the pivot 57 as the centre of rotation, so that the groove 42 is faced by the engaging recess 58.

Meanwhile, in the present disc cartridge shown, an opening 72 engaged by a shutter closing pin provided in recording/reproducing apparatus when the disc cartridge is loaded in a cartridge loading section within such recording/reproducing apparatus with the recording/reproducing apertures 39 and 40 being opened, is formed at the mid position of the connecting web 41c of the shutter member 41. When the disc cartridge, loaded in the cartridge loading unit with the shutter closing pin engaged in the opening 72, is displaced, the shutter member 41 is moved with respect to the cartridge main body 34 in the direction of closing the apertures 39 and 40, that is in the direction indicated by arrows O in Figures 10 and 11. When the shutter member 41 is displaced in this manner, the flexible tab 60 is first deflected resiliently, after which the engaging member 48 rides on the inclined guide surface 61 at the distal end of the locking arm 59 of the shutter locking member 47 which has been rotated and reset in the direction of arrow Y_2 as shown in Figure 20. If the disc cartridge is further extracted outwardly of the cartridge loading section, the engaging member 48 is engaged with the engaging recess 58 of the shutter locking member 57, as shown in Figure 17, to lock the shutter member 41 at the position of closing the apertures 39 and 40, as shown in Figures 10 and 11.

With the disc cartridge shown, an abutment rib 84 is provided for bridging the upper half 32 and the lower half 33, as shown in Figures 9 and 21, within the inside of the cartridge main body 34 between the front side of the cartridge main body 34 along which slides the shutter member 41 and an abutment zone where a top surface of the portion of the arcuate disc housing position controlling wall section 36 faces the front side of the cartridge main body 34.

The abutment rib 84 is formed by the abutting half ribs 84a, 84b upstanding from the inner lateral surfaces of the upper and lower halves 32 and 33.

Specifically, the abutment rib 84 bridging the upper and lower halves 32, 33 is formed parallel to the front side of the cartridge main body 34 at reduced thickness portions of the upper and lower halves at the slide guide recesses 52 and 53.

Although the abutment rib 84 is formed by abutting the upstanding half ribs 84a, 84b formed on the inner lateral surfaces of the upper and lower halves 32, 33, it may also be formed as a single rib extending from one to the other of the upper and lower halves 32, 33.

The abutment rib 84 plays the part of reinforcing the front sides 32a, 33a of the upper and lower halves 32, 33 of the cartridge main body 34 which are unsupported due to the groove 42. Since the abutment rib 84 is provided for bridging the upper and the lower halves 32, 33, the open front side of the cartridge main body 34 is thereby closed.

On the other hand, since the abutment rib 84 is provided slightly inwardly of the front side of the cartridge main body 34, moderate flexibility may be given to the front side of the cartridge main body 34 of synthetic resin formed with the groove 42 to ensure a facilitated mounting operation of the shutter member 41.

As well as the abutment rib 84 reinforcing the front side of the cartridge main body 34, abutment projections 88, 89 are formed, as shown in Figures 22 and 23 on the side edges of the connecting zones 32a, 33c neighbouring to the apertures 39 and 40 which are reduced in width as a result of formation of the apertures 39 and 40, so that these projections 88, 89 may abut each other when the upper and the lower halves abut each other to form the cartridge main body 34.

Referring to Figure 24, the abutment projections 88, 89 are made up of upstanding sections 88a, 89a formed on the inner lateral sides of the upper and the lower halves 32, 33, respectively, and abutment surface sections 88b, 89b horizontally extended from the upstanding sections 88a, 89a towards the inside of the recording/reproducing apertures 39, 40. The abutment surface sections 88a, 89a play the role of increasing the abutment area between the projections 88, 89.

Referring to Figures 22 and 23, the distal ends of the abutment surface sections 88b, 89b are arcuate in profile to conform to the outer periphery of the magneto-

optical disc 31 accommodated in the cartridge main body 34.

The distal end of the abutment surface section 89a of the abutment projection 89 of the lower half 33 is formed with an abutment controlling portion 89c of substantially the same height as the thickness of the abutment surface section 88b of the abutment projection 88 of the upper half 32.

The abutment controlling portion 89c is arranged to be arcuate in profile to form a part of the arc of a circle continuous to the abutment controlling wall section 36b constituting the disc housing position controlling wall 6, as shown in Figure 9.

It should be noted that, since the abutment projections 88, 89 are made up of upstanding parts 88a, 89a to ensure abutment height and abutment surface sections 88b, 89b extending horizontally from the upstanding sections 88a, 89a, the abutment projections 88, 89 may be of a thickness D_2 which is approximately equal to the thickness D_1 of the major surface of the upper or lower halves 32, 33. For this reason, if the abutment projections 88, 89 are formed with the abutment surface sections 88b, 89b to increase the abutment area, it becomes possible to avoid the formation of thickened portions due to the provision of these abutment projections. The result is that moulding distortions otherwise caused by the provision of the abutment projections 88, 89 may be prevented when moulding the upper and the lower halves 32, 33 from synthetic resin.

When the upper and the lower halves 32, 33 are abutted and connected to each other to form the cartridge main body 34, the abutment projections 88, 89 provided on the upper and the lower halves 32, 33 are abutted to each other, as shown in Figure 24, with the abutment surface sections 88b, 89b abutting against each other and with the abutment controlling portion 89c controlling the abutment position of the abutment surface section 88b of the abutment projection 88 of the upper half 32. The abutment projections 88, 89, thus abutted to each other, provide a reinforcement 90 to reinforce the connecting zones 32a, 33c of reduced thickness adjacent to the recording/reproducing apertures 39, 40, while providing a bottom of the groove 42.

When the abutment projections 88, 89 abut each other, since the distal end of the abutment surface section 88b of the abutment projection 88 of the upper half 32 is controlled by the abutment controlling portion 89c, it becomes possible to control abutment position deviations between the projections 88, 89 positively to prevent distortion or deformation of the cartridge main body more reliably.

By providing the above-described abutment projections 88, 89, it becomes possible to ensure strength of the connecting zones 32a, 33c which are reduced in thickness and hence in strength due to provision of the apertures 39, 40 to render it possible to maintain sufficient strength of the cartridge main body 34. Above all, a sufficient strength may be ensured of the front side of the cartridge main body 34 which may be easily flexed and deformed due to provision of the groove 42. Since the strength of the front side of the cartridge main body 34 is ensured, the shutter member 41 fitted to this front side may be held positively with respect to the cartridge main body 34.

The annular plate support 80 to receive the metal plate 30 attached to the magneto-optical disc 31 housed within the cartridge main body 34 is, as shown in Figure 25, formed on the inner surface of the upper half 32 to face the metal plate 30 attached to the magneto-optical disc 31 which is housed within the disc housing section so as to be controlled as to the radial movement, and is in the form of a ring which is slightly smaller in diameter than the disc-shaped metal plate 30.

Thus the plate support 80 projects to a height which is equal to or slightly smaller than the height of the disc supporting lug 81 formed on the inner surface of the upper half 32. When a load uplifting the magneto-optical disc 31 is applied by means of the aperture 38 for the disc table, the plate support 80 supports the metal plate 30 substantially at the same time that the disc support lug 81 supports the disc substrate. Thus, when the metal plate 30 is mounted substantially flush with the major surface of the disc substrate, as in the case of the magneto-optical disc 31 shown, the plate support 80 is provided on the inner surface of the upper half 32 with a height approximately equal to that of the disc support lug 81 or, alternatively, with a height slightly smaller than that of the disc support lug 81, in consideration of the mounting tolerance of the metal plate 30.

With the disc cartridge shown, the inner surface of the upper half 32 of the cartridge main body 34 is formed with the recess 82 to clear a protuberance 31d of the magneto-optical disc 31 accommodated in the cartridge main body 34. The recess 82 is provided at a position in register with the protuberance 31d of the magneto-optical disc 31 accommodated in the disc housing section of the cartridge main body 34 so as to be restricted in radial movement, and is formed as to be annular between the disc support boss 81 and the plate support 80. The recess 82 is formed as a recessed groove formed by reducing the thickness of the portion of the upper half 32 which is delimited between the disc support lug 81 and the plate support 80.

The recess 82 is of a depth large enough to prevent the protuberance 31d projecting on one major surface of the disc substrate of the optical disc 31 from contacting the upper half 32 when the magneto-optical disc 31 is uplifted towards the upper half 32 within the cartridge main body 32 so as to be supported by the disc support lug 81 as shown in Figure 26. Thus the depth of the recess 82 is selected in consideration of the height of the protuberance 31d which results from attachment of the metal plate 30 on one major surface of the disc substrate of the optical disc 31.

However, the depth of the recess is so set that the upper half 32 is not reduced in thickness excessively such that mechanical strength of the upper half is not compromised.

A second embodiment of disc cartridge is shown in Figures 27 to 33. Those parts or components which are common to those of the preceding embodiment are designated by the same reference numerals and the detailed description is omitted for simplicity.

With the disc cartridge of the second embodiment, a plate support 91 is provided to receive the metal plate 30 mounted on the magneto-optical disc 31 accommodated in the cartridge main body 34. The plate support 91 is provided on the inner surface of the upper half 32 to face the metal plate 30 attached to the magneto-optical disc 31 accommodated in a disc housing section so as to be controlled in radial movement, and is formed as a ring of a diameter slightly smaller than the diameter of the disc-shaped metal plate 30.

Referring to Figure 27, the plate support 91 has a height approximately equal to or slightly lower than a disc support boss 92 on the inner surface of the upper half 32. That is, the plate support 91 is so arranged that, when an uplifting load is applied to the magneto-optical disc 31 by means of the aperture 38 for the disc table, the plate support 91 is able to support the metal plate 30 at substantially the same time that the disc support boss 92 supports the disc substrate. Thus, when the metal plate 30 is mounted substantially flush with the major surface of the disc substrate, as in the case of the present magneto-optical disc 31 shown, the plate support 91 is provided on the inner surface of the upper half 32 with a height approximately equal to that of the disc support boss 92 or, alternatively, with a height slightly smaller than that of the disc support boss 92, in consideration of the mounting tolerance of the metal plate 30. By providing the plate support 91 as described above, when the metal plate 30 is thrust by means of the centre aperture 31a faced by the aperture 38 for the disc table to uplift the magneto-optical disc 31 in the direction shown by arrow Y in Figure 28, the metal plate 30 is also supported by the plate support 91 at the same time that the disc substrate of the magneto-optical disc 31 is supported by the disc support boss 92, or the metal plate is brought into close proximity with the plate support 91. Since no wide gap is produced between the metal plate 30 and the inner surface of the upper half 32, it becomes possible to prevent a large load from being applied only to the metal plate 30 and hence to prevent the metal plate 30 from being peeled or detached from the disc substrate of the magneto-optical disc 31.

Although the plate support 91 is formed as a continuous ring in the above-described embodiment, it could instead be formed by a series of small projections 91a arranged in a ring of a slightly smaller diameter than that of the metal plate 30 as shown in Figure 29.

The plate support 91 could instead be formed by an annular ring-shaped projection 91b supporting the outer perimeter of the metal plate 30 and a further annular ring-shaped projection 91b supporting the inner periphery of the metal plate 30, as shown in Figure 30.

The plate support 91 could be formed as a circular projection 91c substantially corresponding to the outside diameter of the metal plate 30, as shown in Figure 31.

The plate support 91 could be formed by a series of parallel ribs 91d disposed within the extent of a circle corresponding to the metal plate 30, as shown in Figure 32.

The plate support 91 could be formed by ribs 91e radially extended from the position of the plate support corresponding to the centre of the metal plate 30, as shown in Figure 33.

In summary, the plate support 91 may be of any desired shape if it is capable of supporting the metal plate 30 at the same time that the disc support boss 92 supports the disc substrate of the magneto-optical disc 31 when the metal plate 30 is thrust to uplift the magneto-optical disc 31 towards the upper half 32.

A third embodiment is hereinafter described with reference to Figures 34 to 37 and it should be noted that parts or components corresponding to those of the preceding embodiments are denoted by the same reference numerals and the corresponding description is omitted for simplicity.

In the third embodiment of the disc cartridge D_2, an abutment projection 97 and an abutment support 96 making up a reinforcement 94 abut and are connected to each other at a position corresponding to connecting zones 93, 98 adjacent to the apertures of the upper half 32 and the lower half 33, as shown in Figure 35, to reinforce the narrow width connecting the zones 93, 98 and to provide the bottom of the groove 42. The abutment support 96 is formed with an abutment support extension 96a projecting inwardly of the recording/reproducing apertures 39, 40 to provide a width wider than the width of the connecting zone 98 to ensure a sufficient strength of the connecting zones 93, 98 of a narrow width as shown at W_5 in Figure 35 and a weak strength when the abutment projection 97 is abutted to form the reinforcement 94. The end face of the abutment support extension 96a is formed as an arc of a circle corresponding to the outer periphery of the magneto-optical disc 31.

With the disc cartridge D_2 of the third embodiment, the abutment support extension 96a at the distal end of the abutment support 96 projecting into the connecting zone 98 of the aperture is formed with a clearance 95 to permit intrusion of a magnetic field generating coil 102 attached to the end of a movement support arm 101 constituting an external magnetic field generator 100 adapted to act on the signal recording region of the magneto-optical disc 31. This clearance 95 is formed at the centre in the front side of the cartridge main body 34.

By abutting the abutment projection 97 and the abutment support 96 to form the reinforcement 94, a sufficient strength may be ensured at the front side of the cartridge main body 34 which is reduced in width by the formation of the recording/reproducing apertures 39, 40 and lowered in strength by providing the groove 42.

When the disc cartridge D_2 according to the third embodiment is loaded on the recording/reproducing apparatus to record information signals, such as musical sound signals, an optical pickup, not shown, which is recording/reproducing means arranged at the recording/reproducing apparatus, and the coil 102 of the external magnetic field generating device 100, are faced by the major surfaces of the magneto-optical disc 31 by means of the recording/reproducing apertures 39, 40, respectively.

The optical pickup and the coil 102 of the external magnetic field generating device 100 scan the signal recording region of the magneto-optical disc 31 in synchronism across the inner and the outer disc peripheries to record desired information signals.

With the disc cartridge D_2, the optical pickup and the magnetic field generating device 100 reaching the outermost rim of the magneto-optical disc 31 are faced by the clearance 95 of the cartridge main body 31. At least a part of the coil 102 of the external field generating device 100 intruding into the cartridge main body 34 by means of the recording/reproducing aperture 39 and brought into proximity of or into sliding contact with the major surface of the magneto-optical disc 31 may intrude into the clearance 95, as shown in Figure 37.

Thus it becomes possible to scan the signal recording region of the magneto-optical disc 31 extending to close to the outer rim by the optical pickup and the external magnetic field generating device 100 across the inner and outer peripheries of the disc.

In the third embodiment, the abutment support extension 96a extending into the recording/reproducing aperture 40 is formed only at the abutment support 96 provided on the lower half 33. However, a similar abutment extension 97a extended into the recording/reproducing aperture 39 may also be formed at the distal end of the abutment projection 97 formed on the upper half 32 to provide a greater width of the abutment projection 97. By providing the abutment projection 97 of the upper half 32 and the abutment support 96 of the lower half 33 of increased widths, the reinforcement 94 formed by abutting the abutment projection 97 and the abutment support 96 is additionally improved in strength additionally to ensure the strength of the front side of the cartridge main body 34 which is reduced in width by the provision of the recording/reproducing apertures 39, 40 and lowered in strength by the provision of the groove 42.

In this case, the clearance 93 is formed in each of the abutment support extension 96a formed at the abutment support 96 of the lower half 33 and the abutment extension 97a formed at the abutment projection 97 of the upper half 32.

Although the foregoing description has been made in connection with the disc cartridge D_2 housing a magneto-optical disc 31 with a diameter of 64 mm, the invention may also be applied to a disc cartridge housing a small-sized disc and which may be reduced in size to suit the disc.

Since the clearance for avoiding the protuberance resulting from the provision of the magnetic member on the disc substrate is provided on the inner surface of the cartridge main body, it becomes possible to prevent contact between the protuberance and the cartridge main body to prevent debris from being produced.

In this manner, it becomes possible to prevent debris from being deposited on the write/read surface of the disc to render it impossible to record and/or reproduce information signals.

Since it is unnecessary to increase the thickness of the cartridge main body to avoid the protuberance, it becomes possible for the cartridge main body to accommodate a small-sized disc and to reduce the size and the thickness of the disc cartridge.

Since the plate support is formed at the position on the inner surface of the cartridge main body rotatably housing the disc fitted with the magnetic plate which is faced by the magnetic plate provided on the disc, the magnetic plate may be supported by the plate support when a force uplifting the magnetic plate is applied by means of the aperture for the disc table formed in the cartridge main body, to prevent the magnetic plate from being detached from the plate support to render it possible to accommodate the disc safely and positively within the cartridge main body.

Since the magnetic member is prevented from being detached, it becomes possible to prevent trouble in clamping the disc to the disc table to render it possible to record or reproduce information signals in stability.

Since the abutment projections abutted and connected to each other are formed at a side edge of the recording/reproducing aperture which is formed at a corresponding position of each of the upper half and the lower half making up the cartridge main body to expose at least a part of the signal recording region of the disc accommodated therein, and the side edge of the recording/reproducing aperture may be reinforced by abutting the abutment projections to each other, it becomes possible to prevent the cartridge main body from being flexed or deformed even if an external force is applied to the disc cartridge.

The shutter locking mechanism of the disc cartridge can be provided with a locking arm engaged by the mating engaging member provided on the shutter member, and a shutter locking member having an independent flexible tab resiliently deflected when the locking arm is thrust, which shutter locking member is rotated about the pivot, while deflecting the flexible tab, to disengage the mating engaging member of the shutter member. In this manner, the locking arm engaged with the shutter member may be formed with high accuracy to realize positive locking of the shutter member. That is, since it is unnecessary to provide the flexible portion in the locking arm, it becomes possible to form the various parts to size even if the parts are produced by moulding synthetic resin.

Besides, since the shutter locking member is mounted by means of the pivot to the cartridge main body, the attachment and detachment operation is also facilitated.

Claims

1. A method for moulding a disc cartridge half (32, 33) by injection moulding of synthetic resin, said cartridge half (32, 33) being rectangular and having a first aperture (38) at the centre for insertion of disc rotating and driving means and a second recording/reproducing aperture (39, 40) at the middle of a lateral side between the first aperture (38) and said lateral side, the cartridge half having a recessed shutter slide area on an outer major surface thereof in which a shutter member (41) to close said second aperture (39, 40) is slid, wherein a gate (87) for injection moulding of synthetic resin is provided at a position close to the first aperture (38) and offset towards the side of the cartridge half provided with the shutter slide area (52, 53) with respect to the centre in the sliding direction of the shutter member (41).

2. A method for moulding a disc cartridge half according to claim 1, wherein the gate (87) for injection of the synthetic resin is inclined at a predetermined angle O towards the side of said shutter slide area (52, 53) with respect to the centre in the direction along the front side of the disc cartridge.

3. A method for moulding a disc cartridge half according to claim 1, wherein the gate (87) for injection of the synthetic resin is inclined 15° towards the side of said shutter slide area with respect to the centre in the direction along the front side of the disc cartridge.

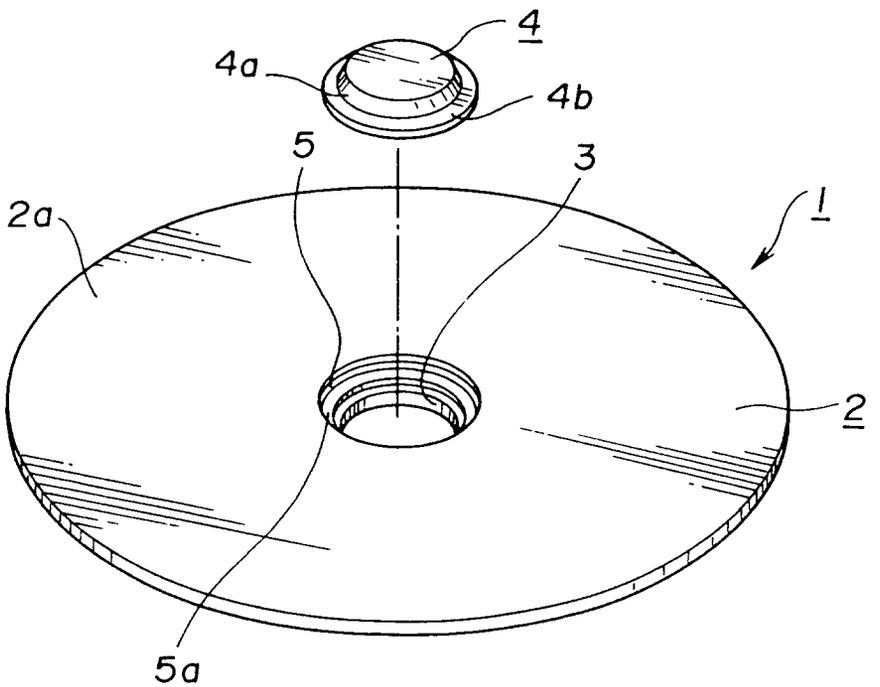

FIG.1

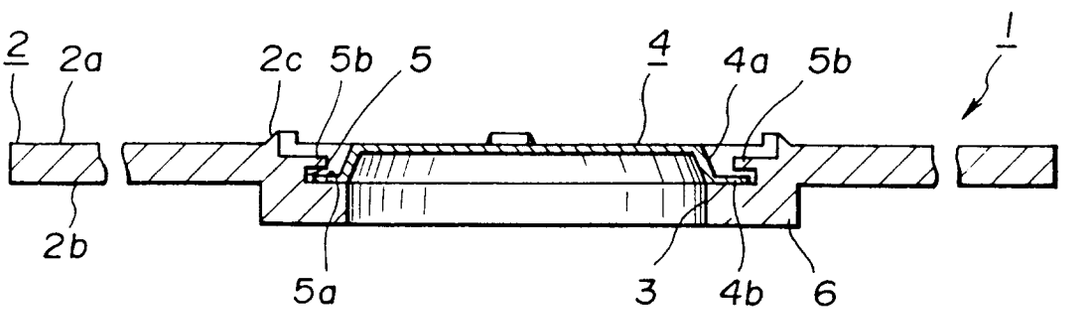

FIG.2

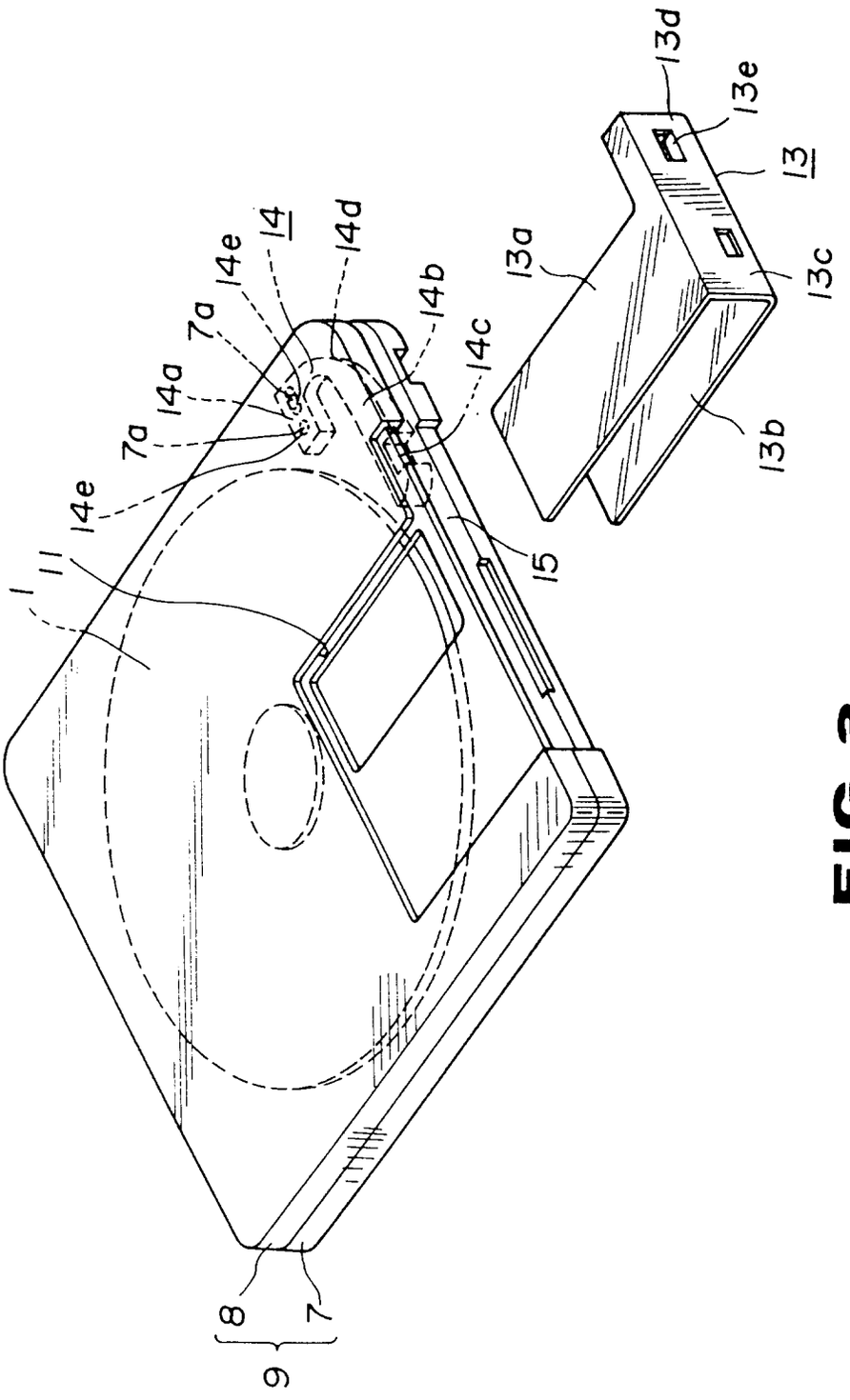

FIG. 3

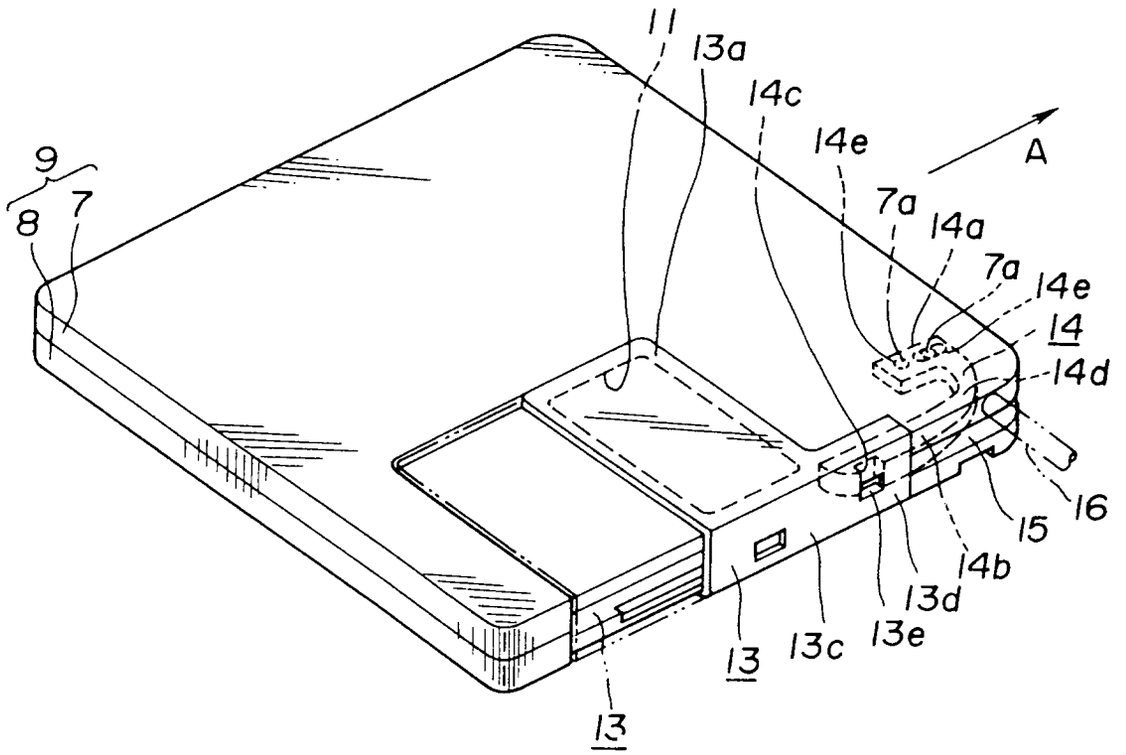
11
13a
14c
14e
A
9
8
7
7a
14a
7a
14e
14
14d
16
15
14b
13d
13e
13c
13
13

FIG. 4

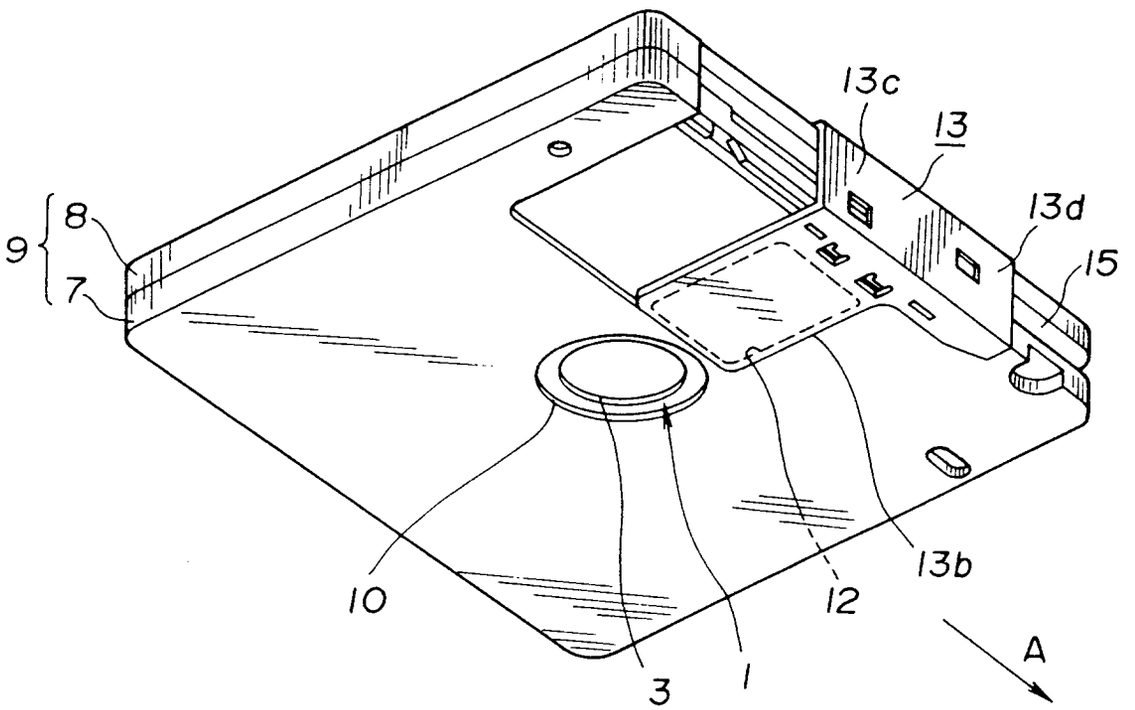

FIG.5

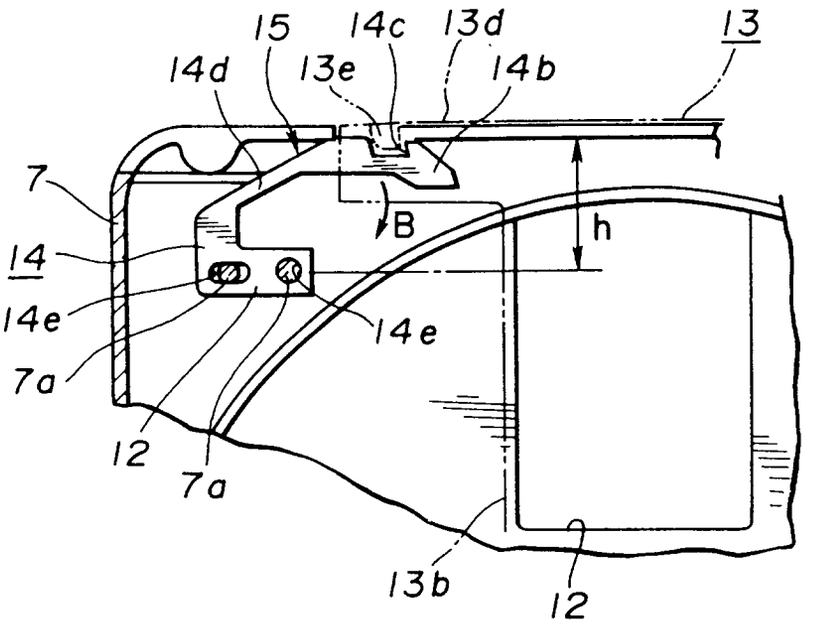

FIG.6

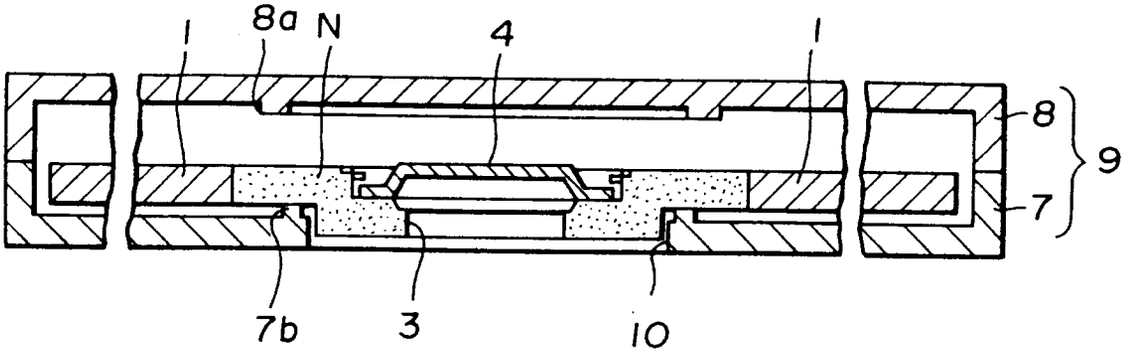

FIG. 7

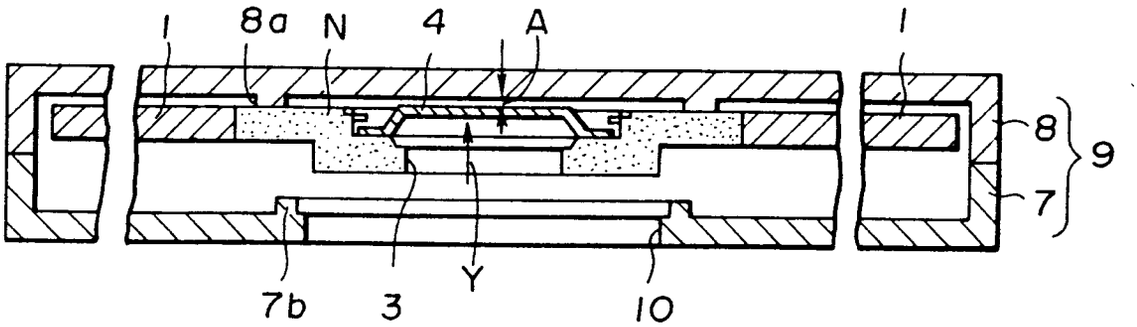

FIG. 8

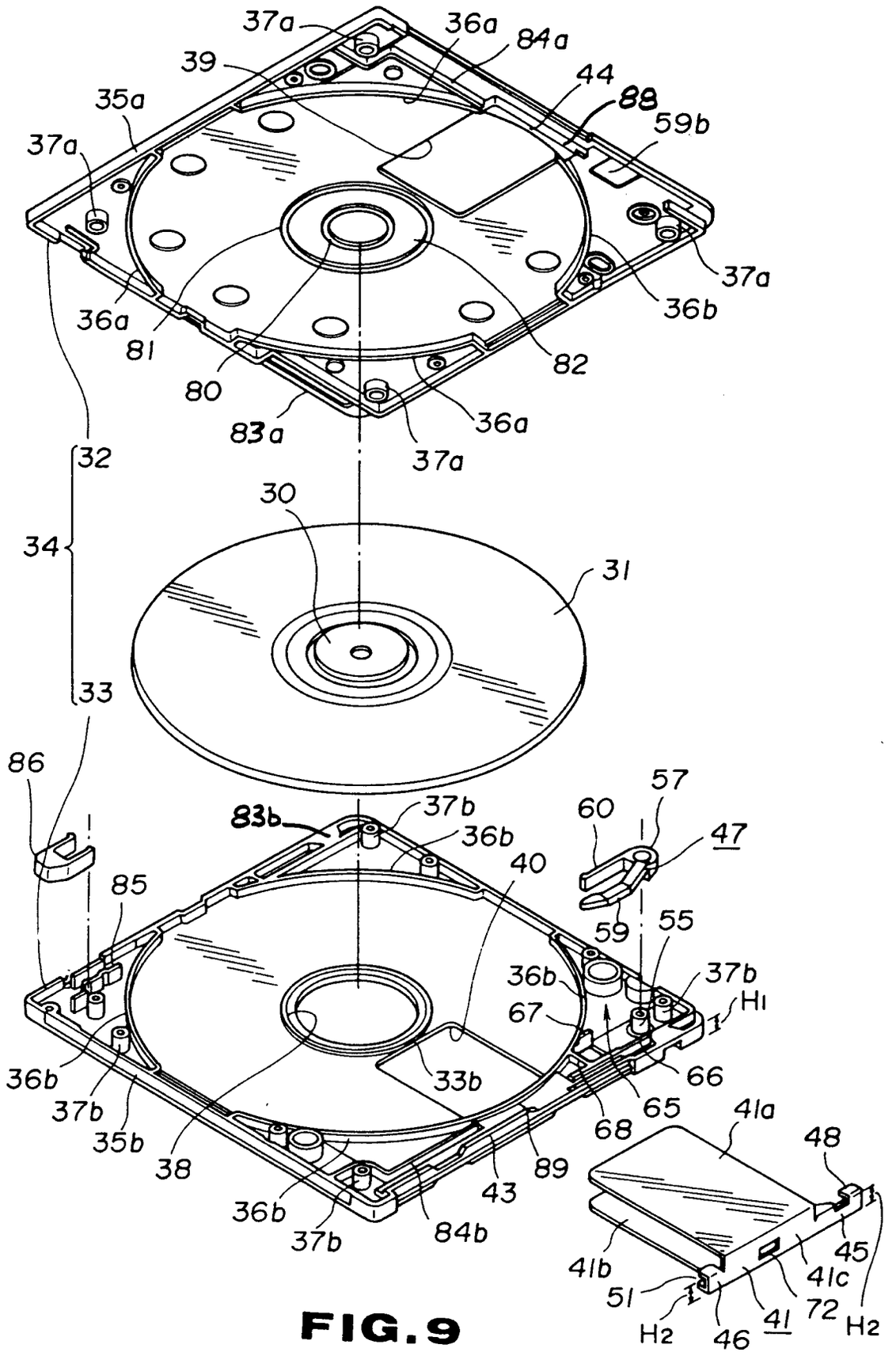
37a
36a
84a
39
44
88
59b
35a
37a
37a
36b
36a
81
82
80
83a
36a
37a
32
34
30
31
33
86
57
83b
37b
60
36b
47
40
85
59
55
36b
37b
H1
67
36b
66
33b
37b
65
41a
35b
68
48
38
89
43
36b
84b
37b
41b
45
41c
51
72
H2
46
41
H2

FIG. 9

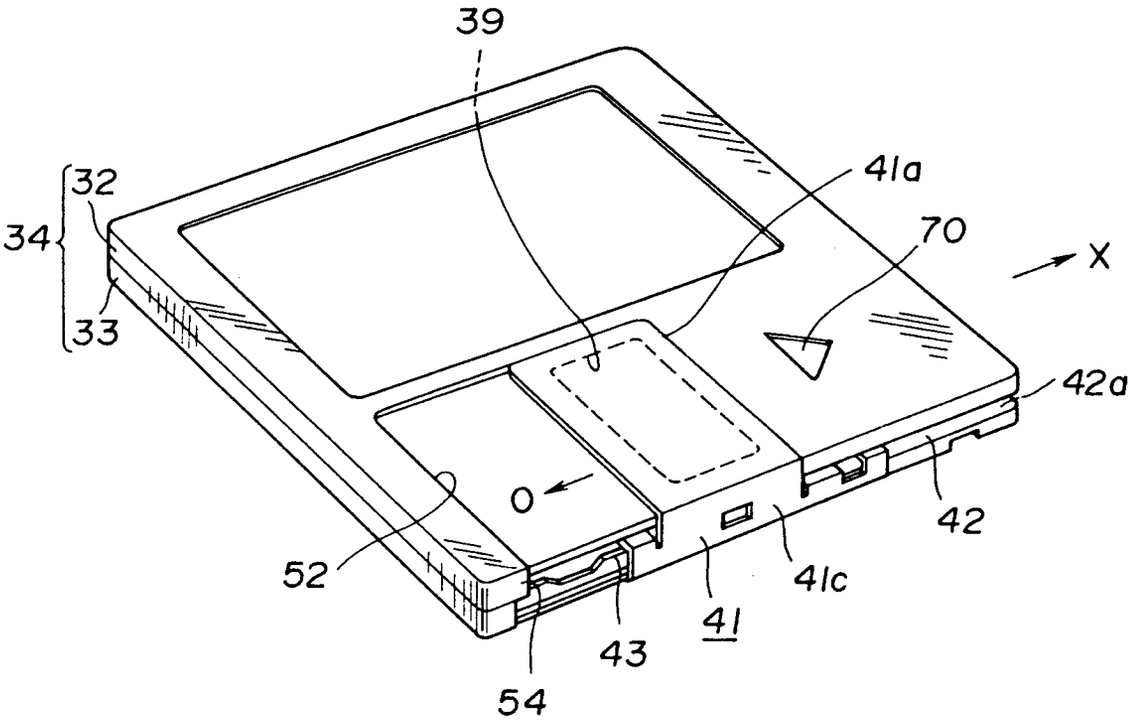
39
41a
70
X
32
34
33
42a
0
42
52
41c
41
43
54

FIG.10

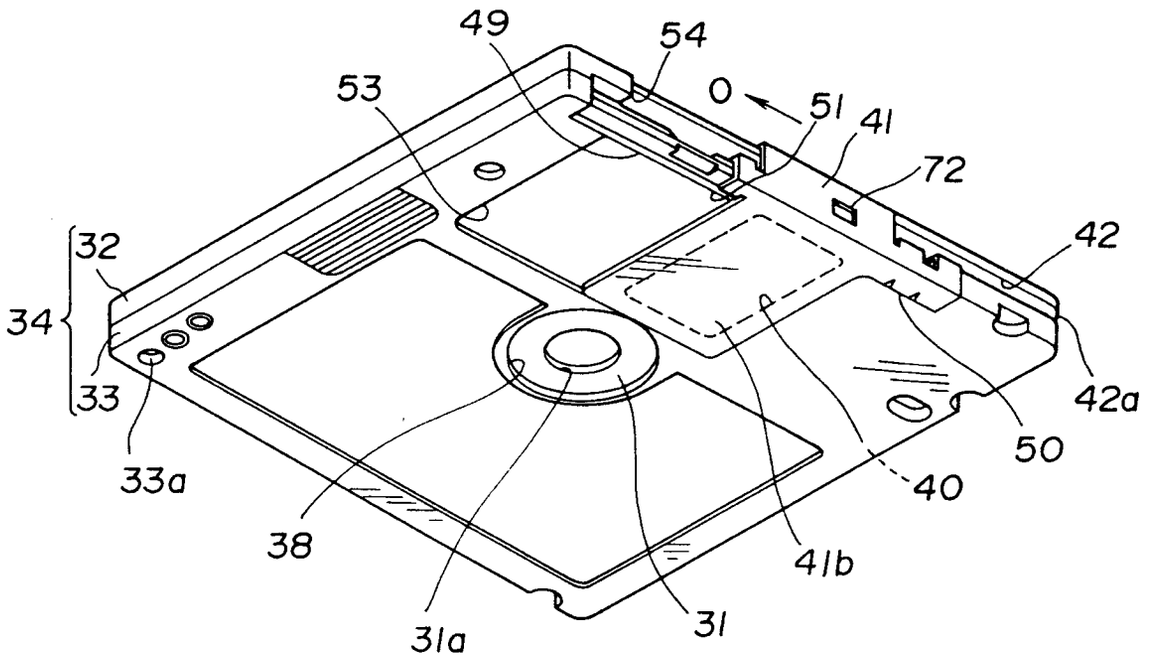
49
54
53
0
51
41
72
42
32
34
33
42a
50
33a
40
38
41b
31a
31

FIG.11

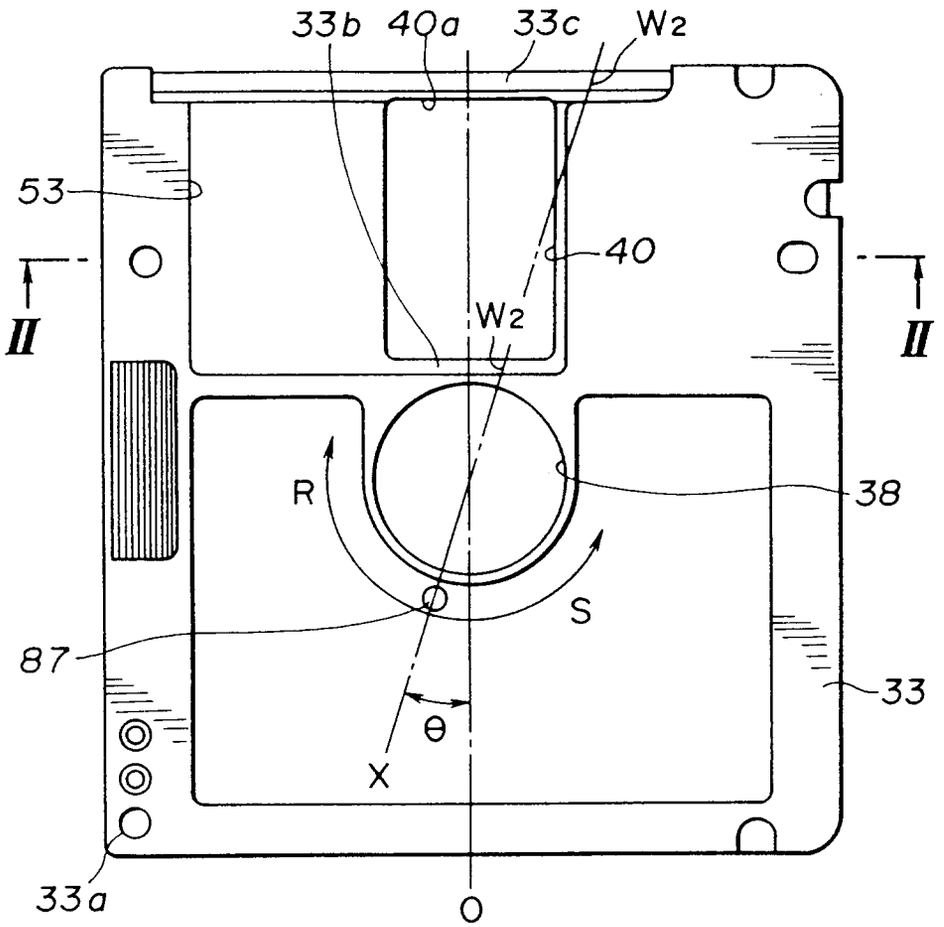

FIG.12

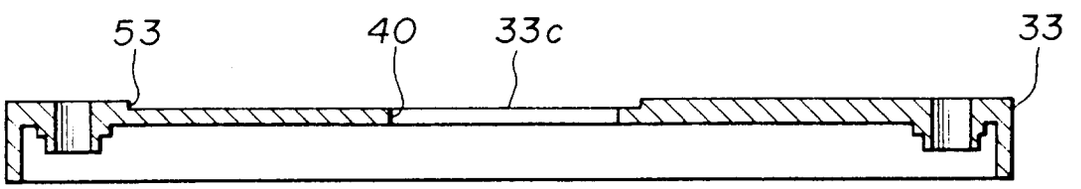

FIG.13

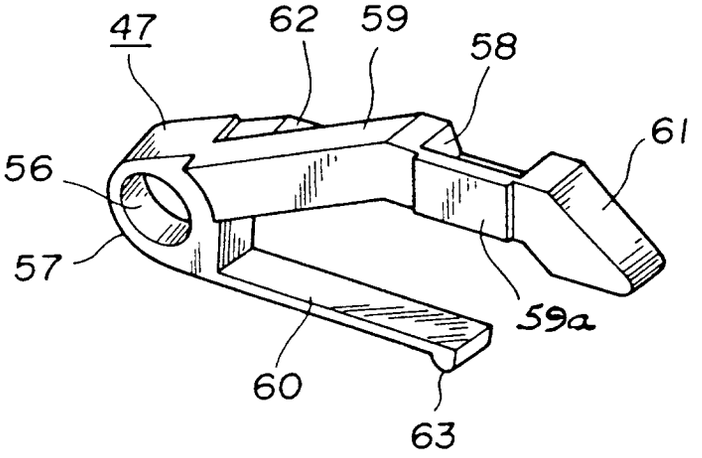

FIG. 14

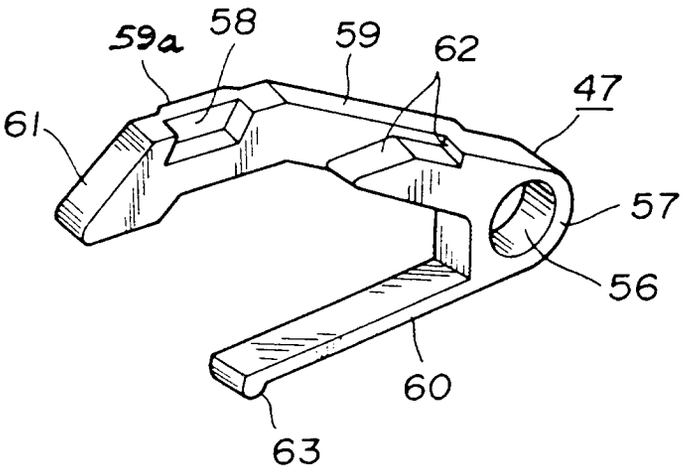

FIG. 15

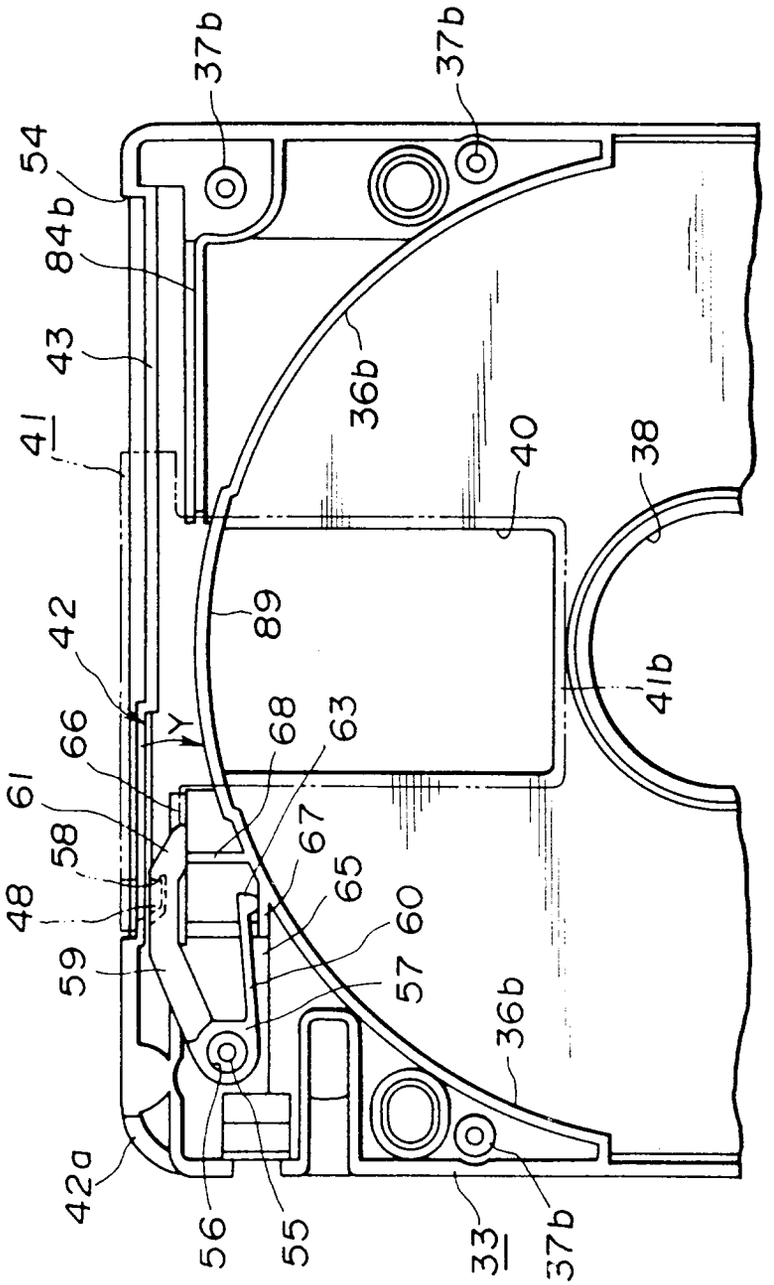
37b
37b
54
84b
43
41
36b
40
38
42
89
41b
66
68
63
Y
61
58
67
65
48
60
59
57
36b
42a
56
55
33
37b

FIG.16

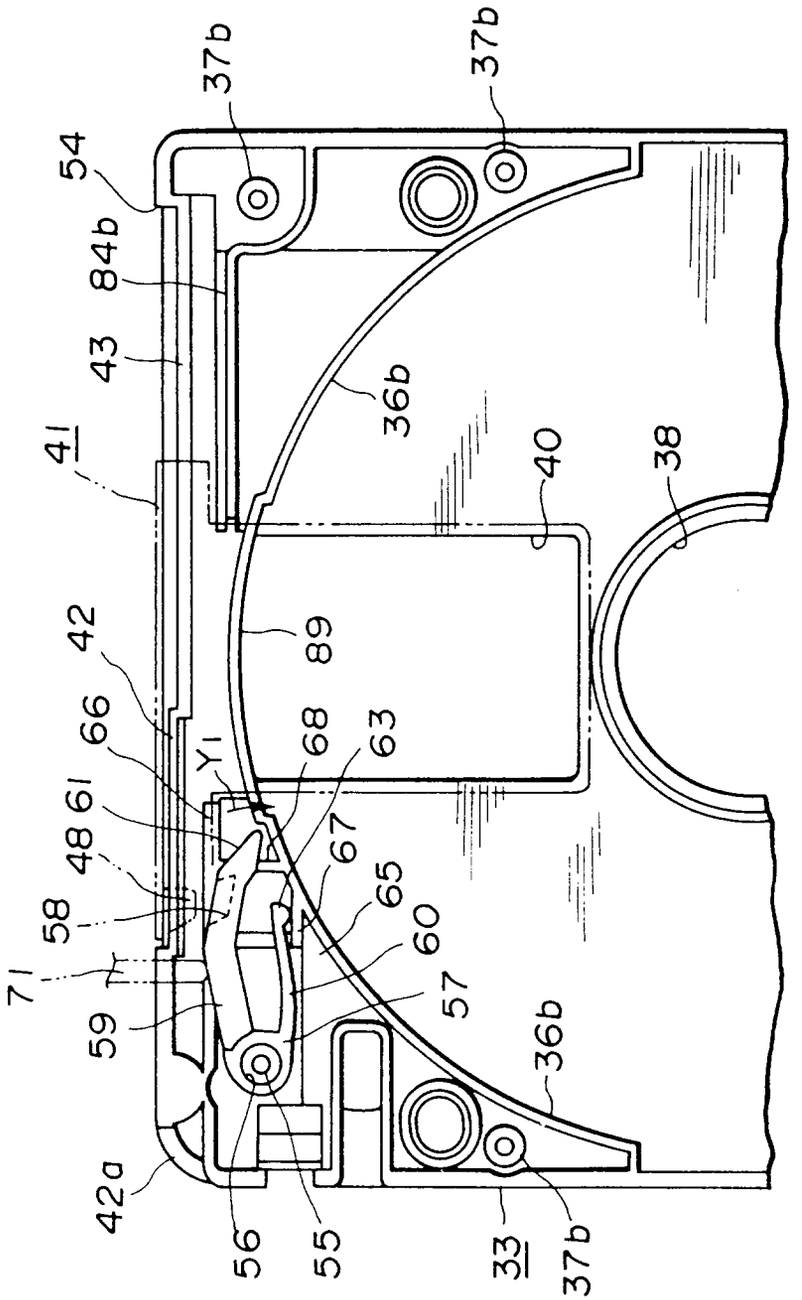
37b
37b
54
84b
43
41
36b
40
38
42
89
66
68
63
Y1
61
48
67
58
65
60
71
57
59
36b
42a
56
55
33
37b

FIG.17

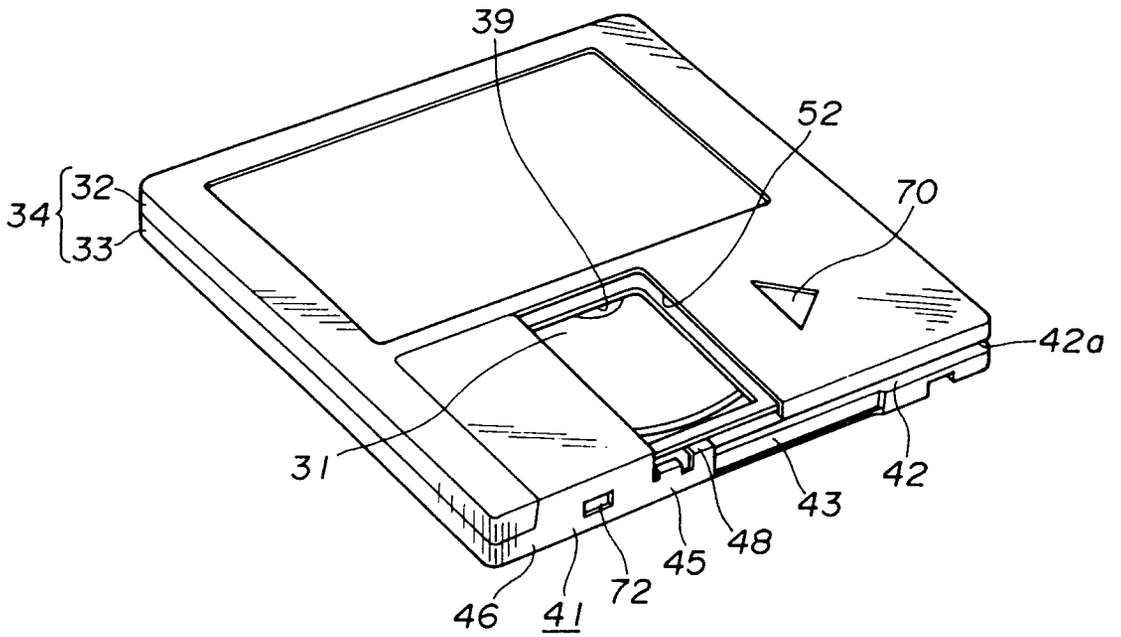
39
52
70
34
32
33
42a
31
42
43
48
45
72
46
41

FIG.18

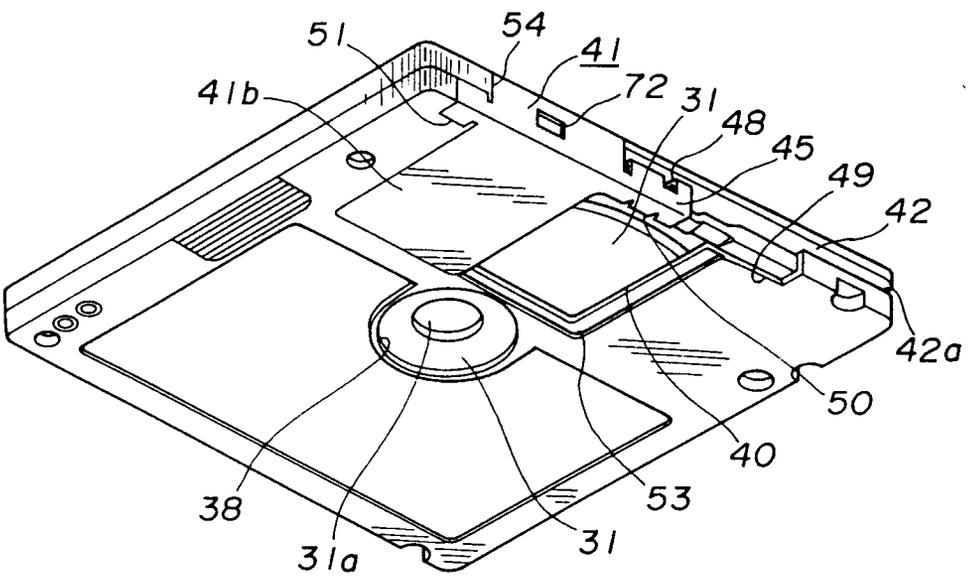
51
54
41
41b
72
31
48
45
49
42
42a
50
40
53
38
31a
31

FIG.19

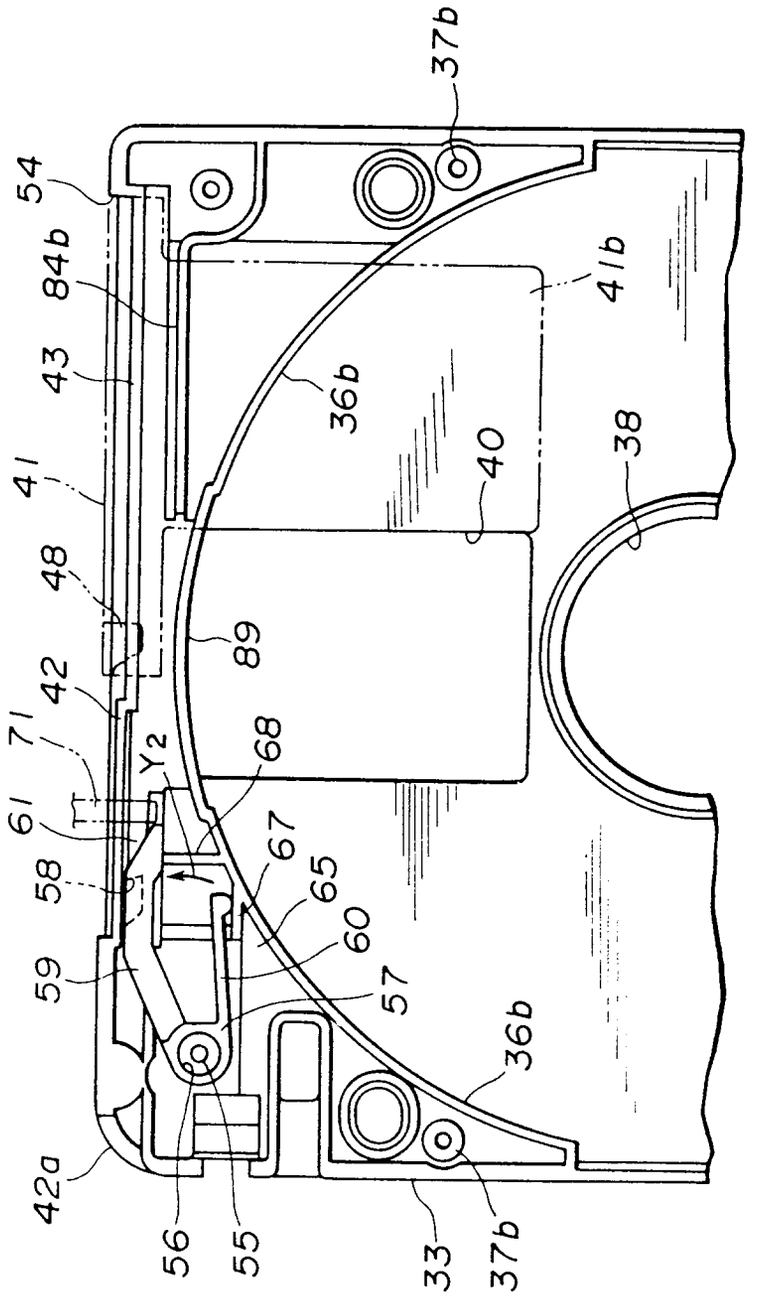
37b
54
84b
41b
43
36b
41
40
38
48
89
42
71
Y2
68
61
67
58
65
60
59
57
36b
42a
56
55
33
37b

FIG.20

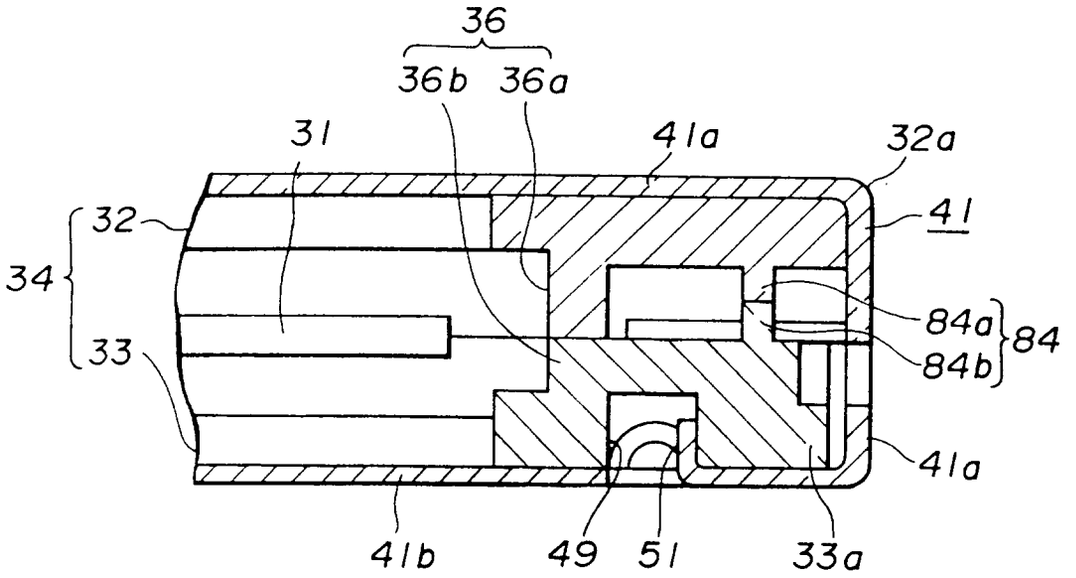
36
36b
36a
31
41a
32a
32
41
34
84a
84
84b
33
41a
41b
49
51
33a

FIG. 21

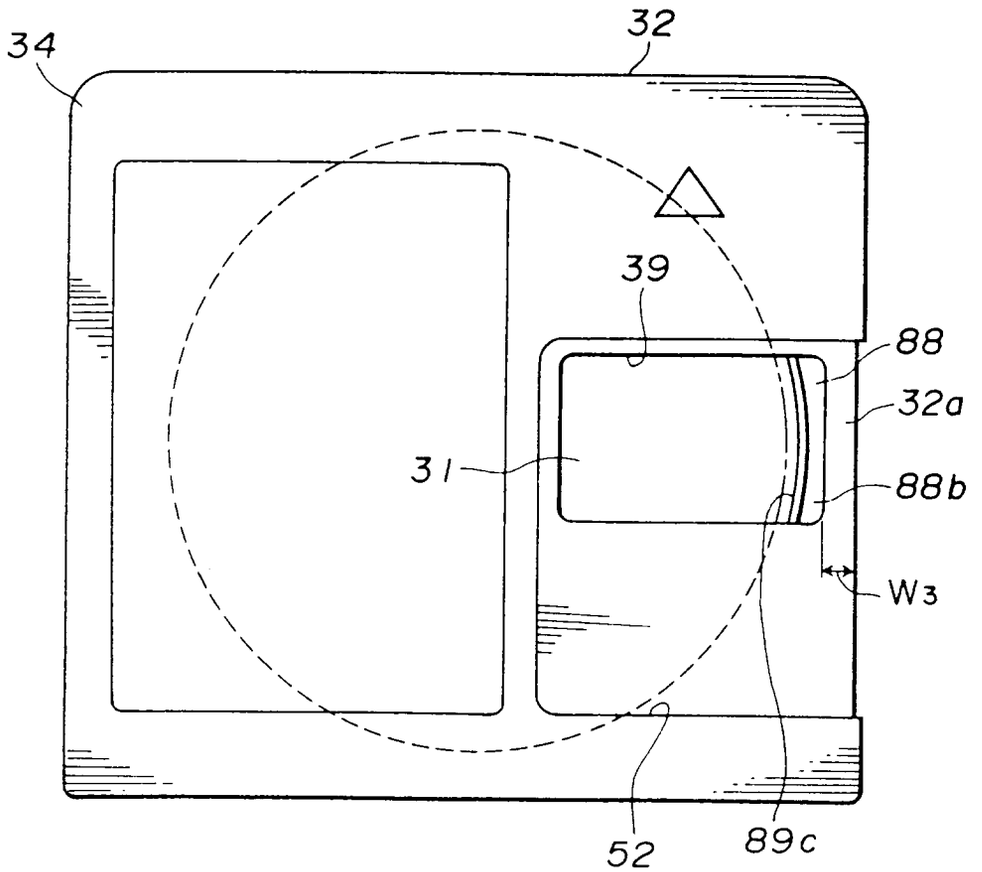
34
32
39
88
32a
31
88b
W3
52
89c

FIG. 22

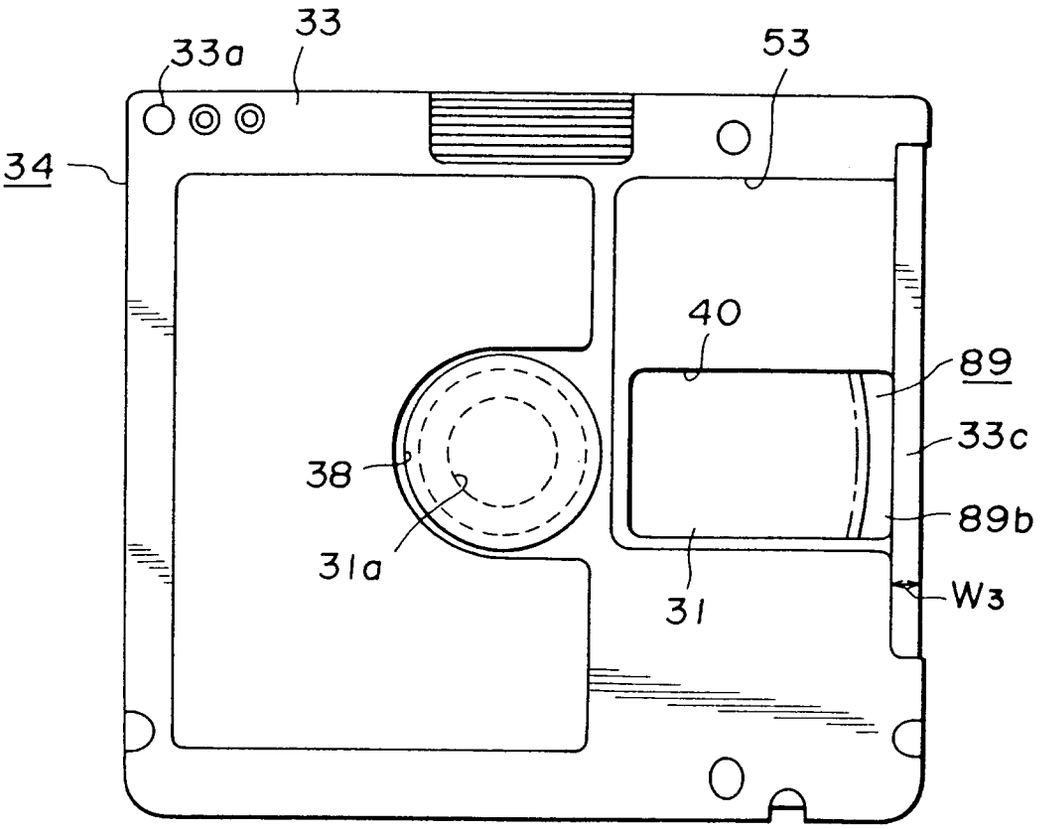
33
33a
53
34
40
89
33c
38
89b
31a
31
W3

FIG.23

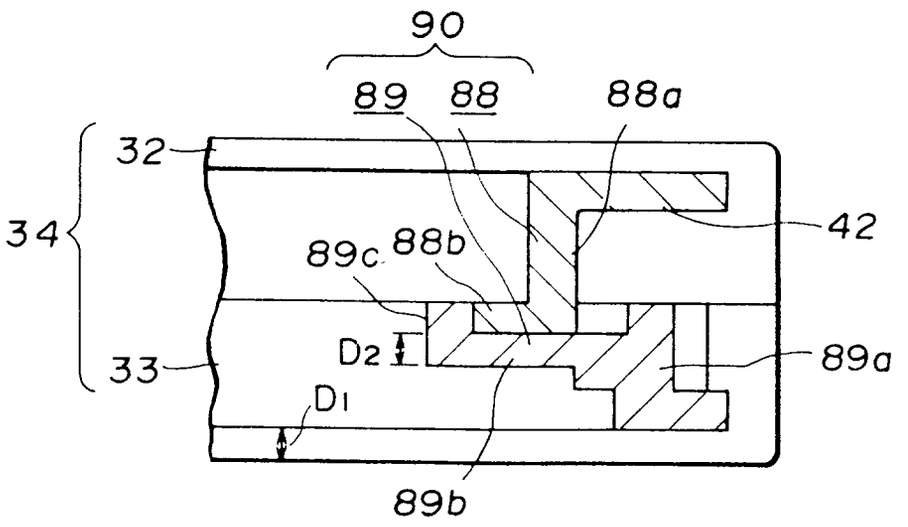
90
89
88
88a
32
34
42
89c
88b
D2
33
89a
D1
89b

FIG.24

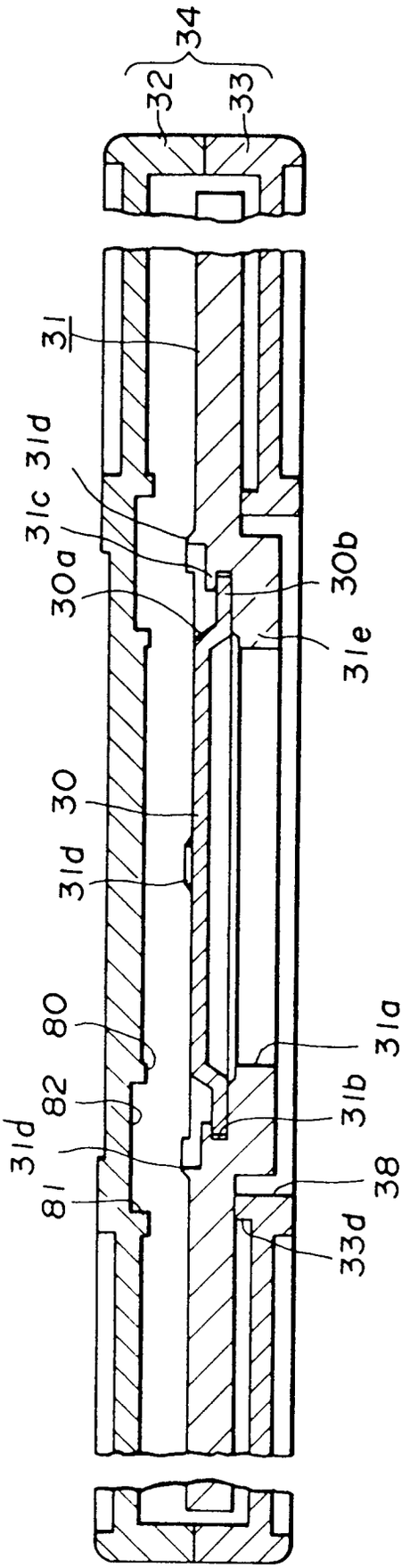

FIG.25

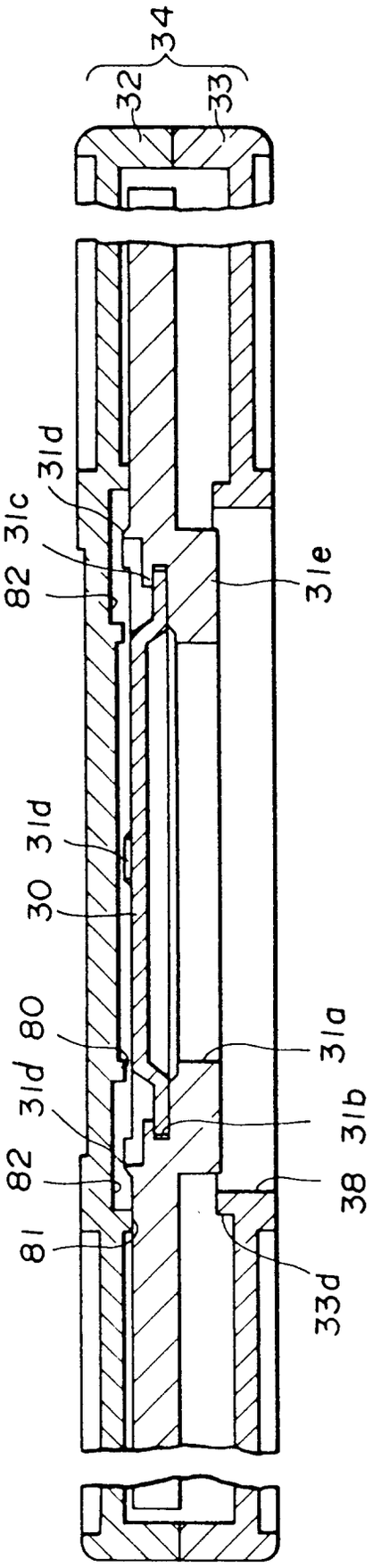

FIG.26

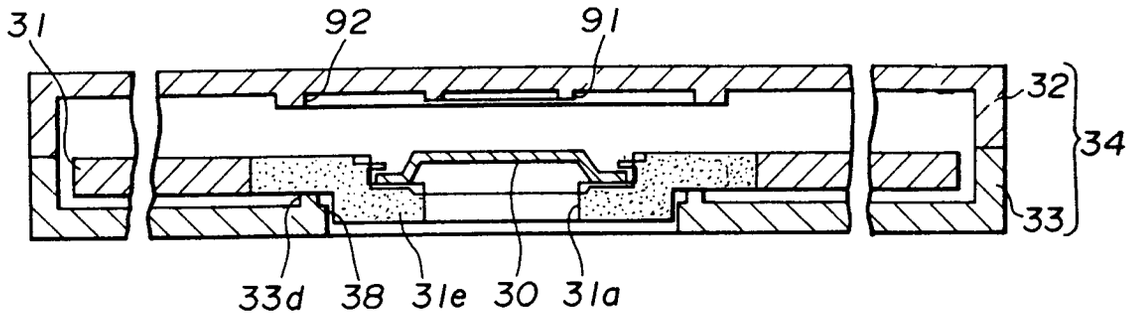

FIG.27

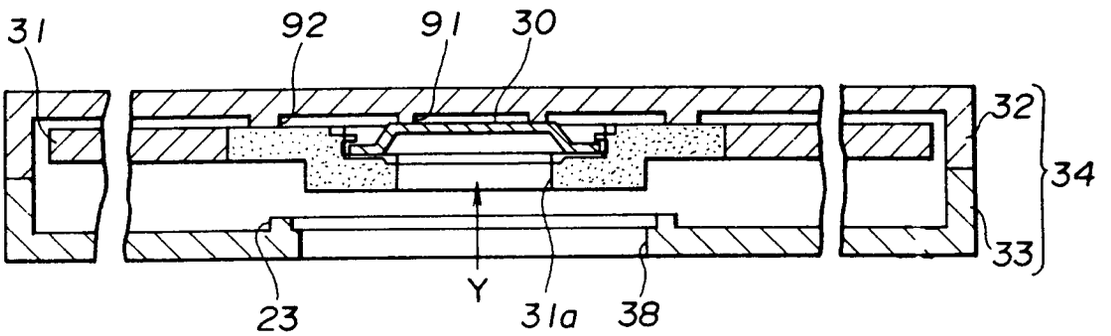

FIG.28

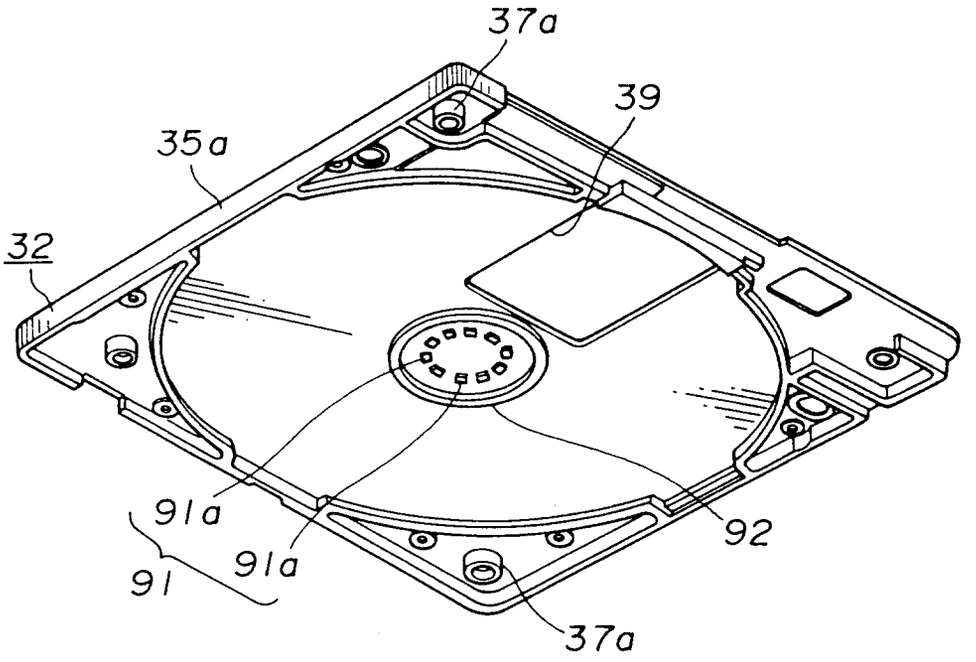

FIG.29

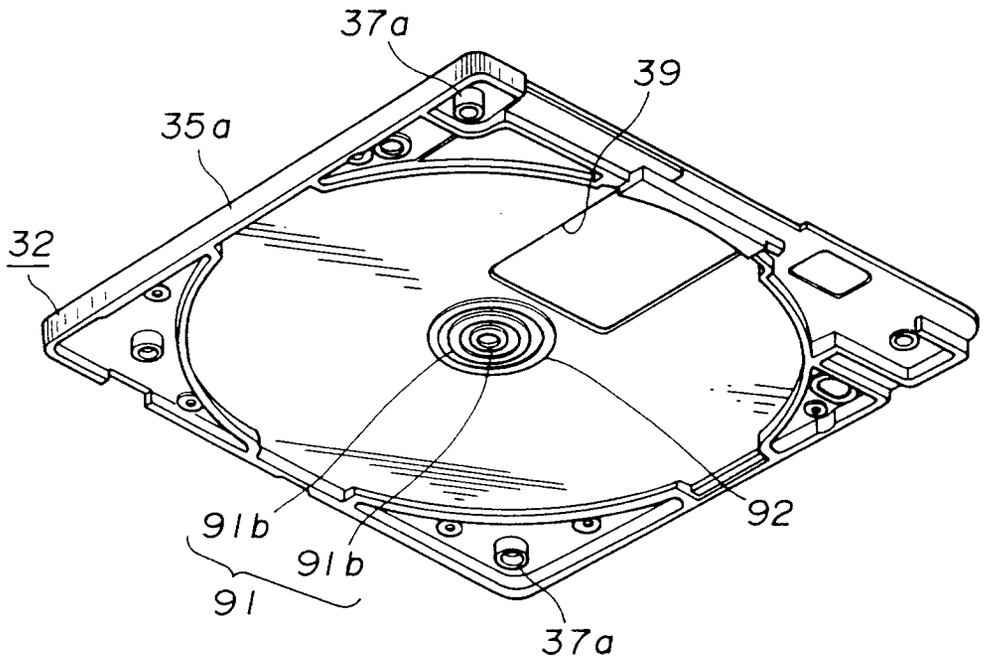

FIG.30

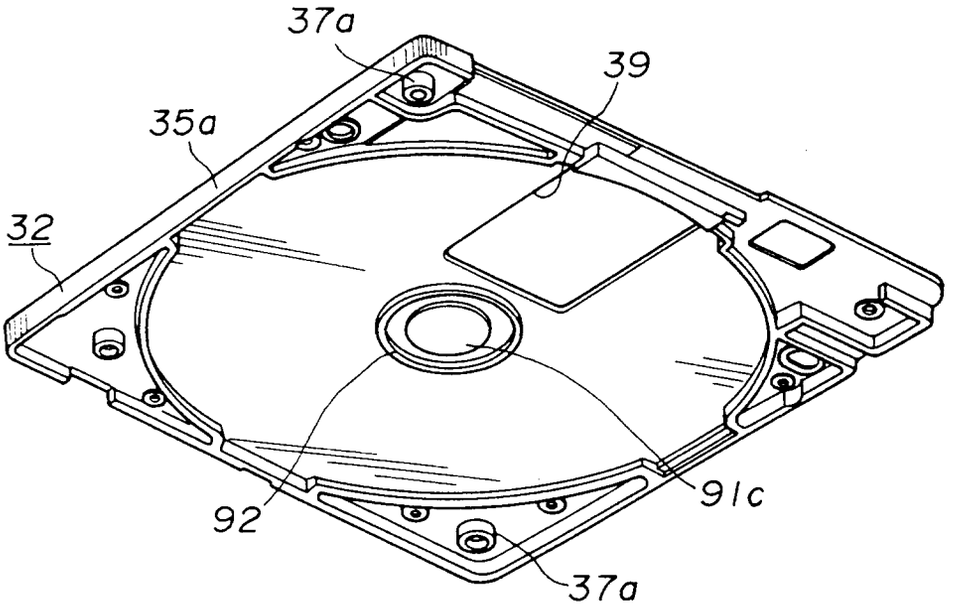

FIG. 31

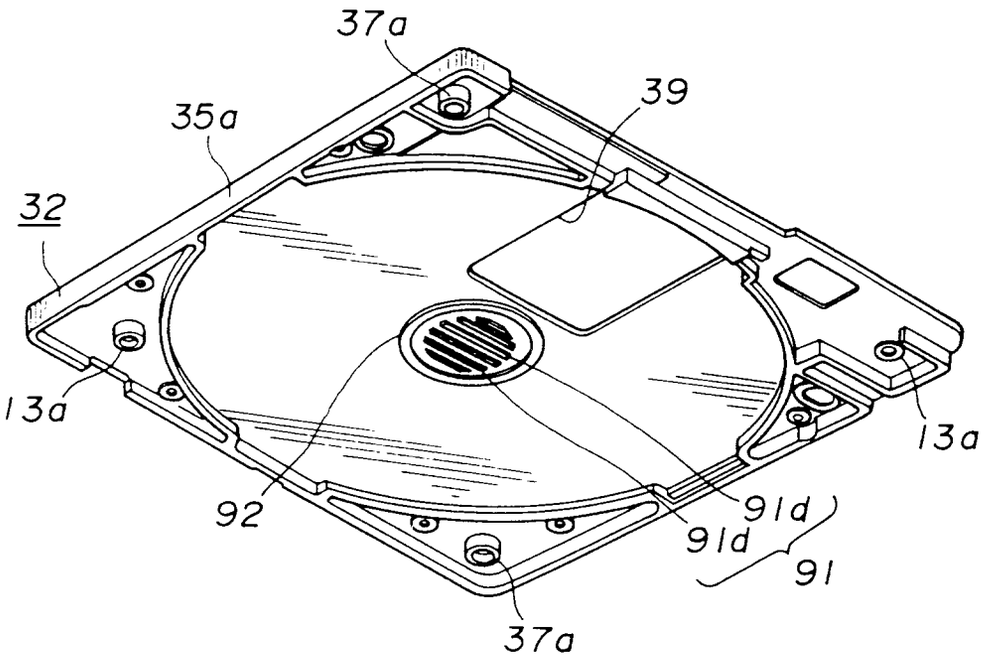

FIG. 32

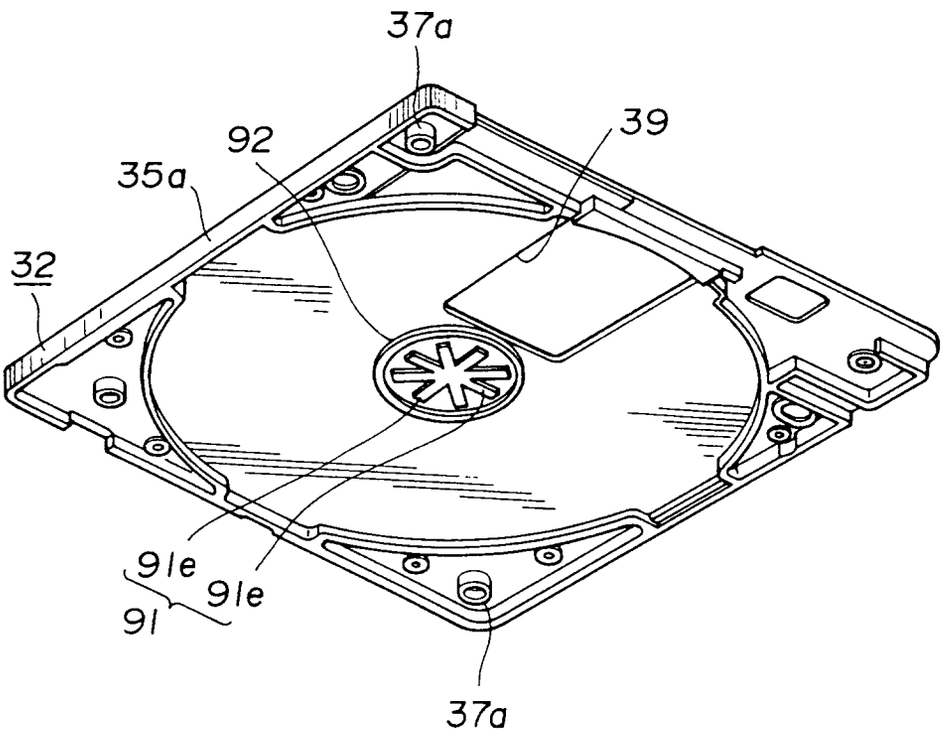

FIG.33

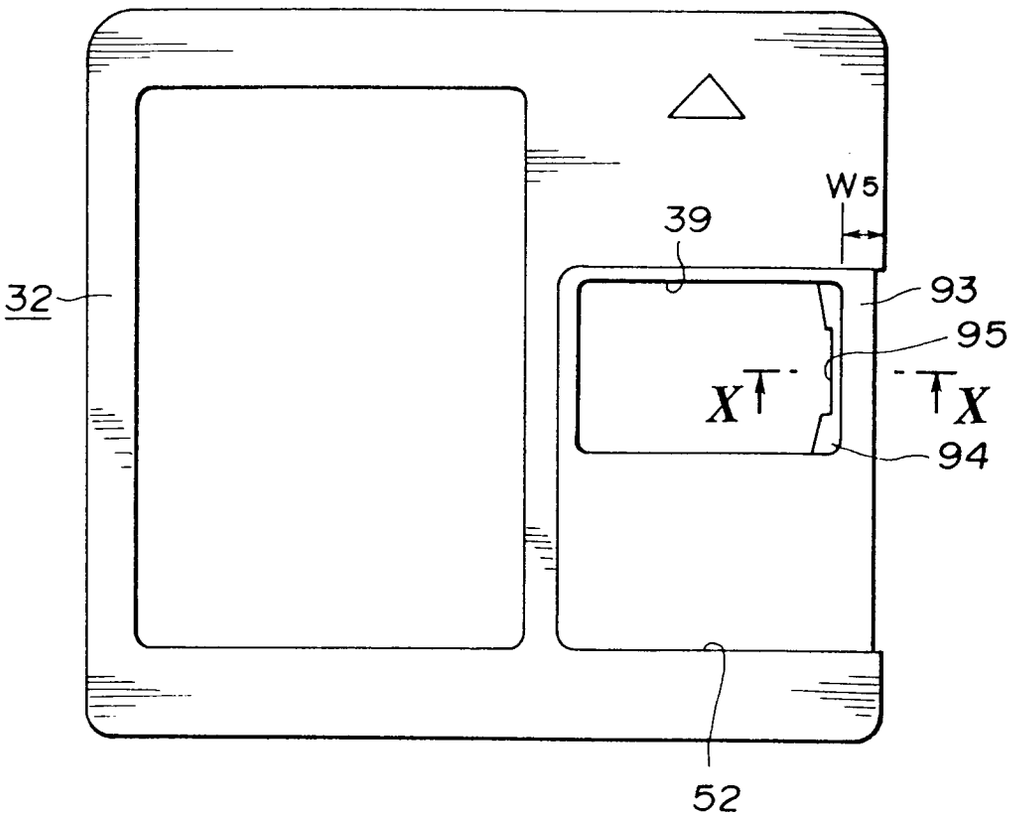

FIG. 34

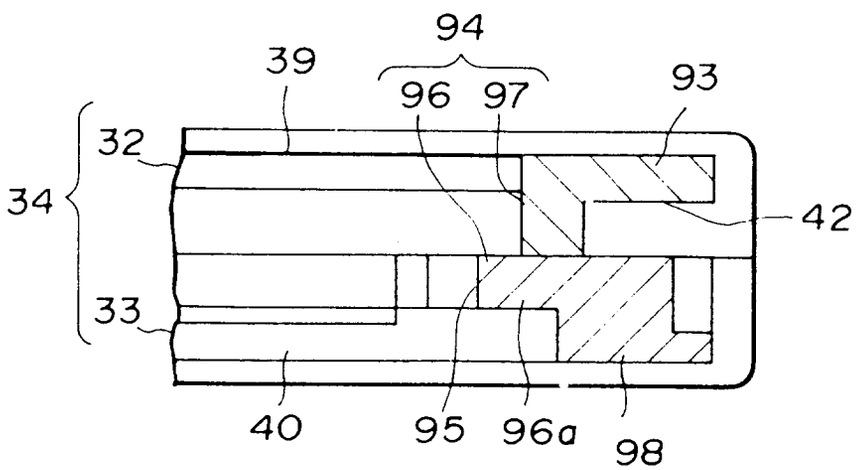

FIG. 35

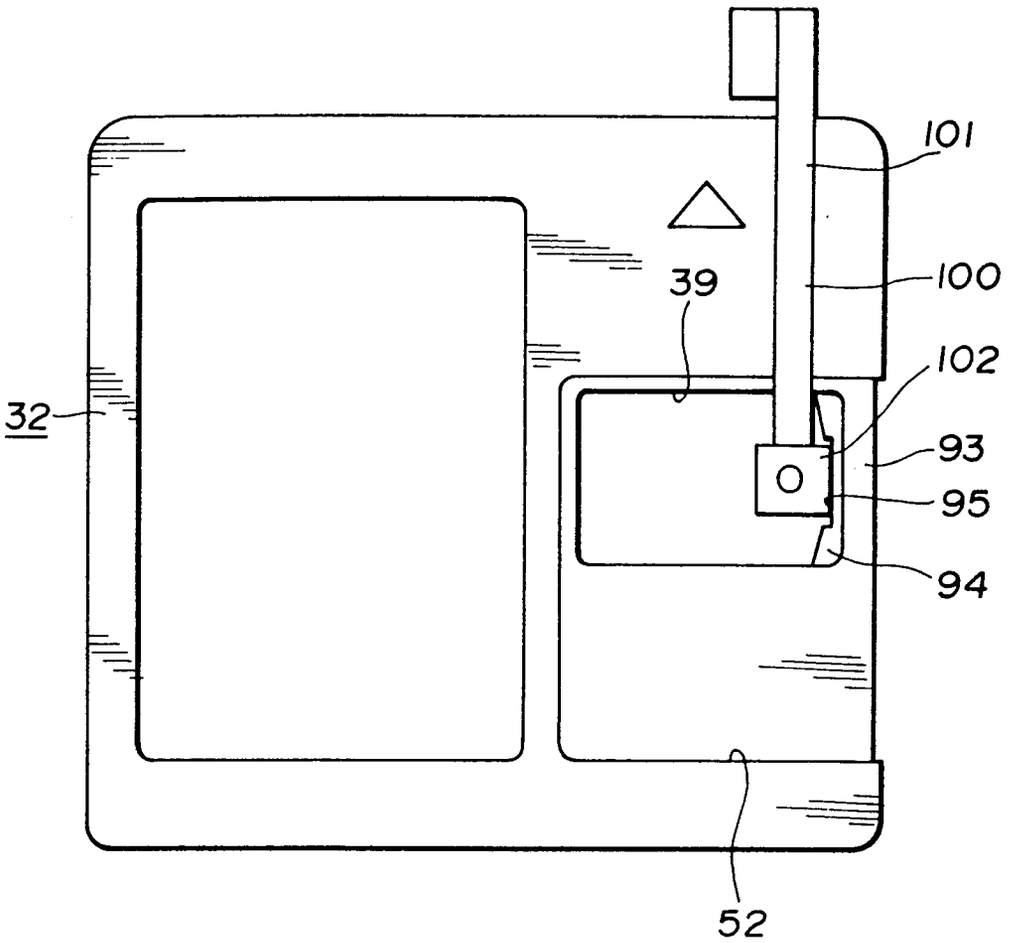
101
100
39
102
32
93
95
94
52

FIG. 36

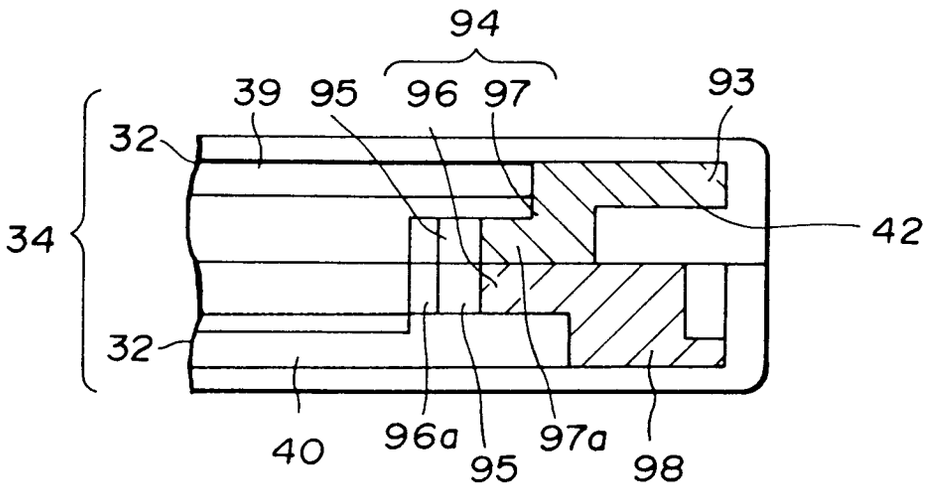
94
39
95
96
97
93
32
34
42
32
40
96a
95
97a
98

FIG. 37